ANNEX C

to

NETWORK OPERATIONS DIRECTIVE

for

NASA MANNED SPACE FLIGHT OPERATIONS

ALSEP OPERATIONS

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NETWORK OPERATIONS DIRECTIVE

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NASA MANNED SPACE FLIGHT OPERATIONS

ALSEP OPERATIONS

June 1969

This Annex to the NOD is effective upon receipt.

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PREFACE

This Annex to the "Network Operations Directive" for NASA Manned Space Flight Operations contains information and instructions applicable to the Apollo Lunar Surface Experiments Package (ALSEP) missions. It was prepared by the Manned Flight Operations Division (MFOD), Goddard Space Flight Center, in response to the following requirements documents:

a. Apollo Saturn V Program Support Requirements Document (PSRD), through Revision 15, dated April 30, 1969

b. Data Acquisition Plan ALSEP annexes.

If there is any conflict between this Annex and the NOD, the procedures in this Annex will take precedence for all activity relative to ALSEP support.

Standard MSFN Documentation procedures will be used to update this Annex. All changes or requests for changes or questions concerning any portion of this document should be directed to GSFC/Code 821.2.

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ILLUSTRATIONS

TABLES

1. MANNED SPACE FLIGHT NETWORK

1.1 GENERAL

1.1.1 The Apollo Lunar Surface Experiments Package (ALSEP) consists of a number of experiments which will be deployed on the lunar surface during Apollo lunar landings. These experiments will be used (1) to investigate and determine the composition and structure of the lunar surface and interior, and (2) to investigate the lunar environment.

1.1.2 Four ALSEPs are being built for deployment during the first four lunar landings. ALSEP 2, which has been modified and redesignated Early Apollo Scientific Experiment Payload (EASEP), will be deployed during the first lunar landing. The other three ALSEPs will be assigned to specific Apollo missions at later dates.

1.1.3 Each ALSEP is a self-contained unit designed to transmit selenophysical information to earth via S-band frequencies for periods of up to 2 years. The unit consists of a power supply, central station, and various experiments. ALSEP 2 (EASEP) has a solar array power supply whereas the other three ALSEPs have Radioisotope Thermoelectric Generator (RTG) power supply.

1.1.4 The ALSEP will be installed in the Lunar Module (LM) before it is stacked with the Saturn vehicle. Once the LM has landed on the moon, the astronauts will deploy the ALSEP on the lunar surface.

1.2 ALSEP EXPERIMENTS DESCRIPTION

1.2.1 PASSIVE SEISMIC EXPERIMENT PACKAGE

The Passive Seismic Experiment Package (PSEP) will measure the natural seismicity of the moon, the lunar free oscillations, and the tidal deformations. The data from this experiment will help determine the strain regime and energy of the moon's interior, the overall elastic properties, and the correlation between seismic sources and visible surface features.

1.2.2 ACTIVE SEISMIC EXPERIMENT

The Active Seismic Experiment (ASE) will be used primarily to generate and monitor artificial seismic waves in the 3 to 250 Hz range in the lunar surface and near subsurface. The ASE can also be used to monitor natural seismic waves in the same frequency range. Data acquired from the ASE will aid in the determination of the physical properties of the lunar surface and near subsurface.

1.2.3 LUNAR SURFACE MAGNETOMETER EXPERIMENT

The Lunar Surface Magnetometer (LSM) Experiment will measure the temporal variations of the local magnetic field vector. Data from this experiment will help determine whether or not the moon has a molten core.

1.2.4 SOLAR WIND SPECTROMETER

The Solar Wind Spectrometer (SWS) will provide information concerning (1) the interaction between the moon and the solar wind, (2) the moon's gross electrical conductivity, (3) the presence of a lunar atmosphere, (4) the effects of radiation on the surface through the mechanisms of sputtering and charging, and (5) the effect of the earth's magnetic field at 240,000 miles.

1.2.5 SUPRATHERMAL ION DETECTOR EXPERIMENT/COLD CATHODE GAUGE EXPERIMENT

The Suprathermal Ion Detector Experiment (SIDE) will be used to provide data pertaining to the density and temperature of the lunar ionosphere as it exists near the lunar surface.

The Cold Cathode Gauge Experiment (CCGE) will be used to determine the neutral particle density at the lunar surface and any variations in that density associated with solar activity. Specifically, the CCGE will be used to measure the pressure of the ambient lunar atmosphere.

1.2.6 HEAT FLOW EXPERIMENT

The Heat Flow Experiment (HFE) will be used to measure the net outward flux of heat from the moon's interior.

1.2.7 CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT

The Charged Particle Lunar Environment Experiment (CPLEE) will be used to measure the energy distribution, time variations, and direction of proton and electron fluxes at the lunar surface. The results of these measurements will provide information on particle phenomena.

1.2.8 LASER RANGING RETRO-REFLECTOR

The Laser Ranging Retro-reflector (LRRR) will measure lunar motion about its center of mass. The retro-reflector consists of reflecting surfaces and serves as a precise reference point. Experimenters will use laser transmitting and receiving equipment at the following locations:

a. USAF Electro-optical Surveillance and Research Facility, Cloudcroft, New Mexico

b. ARPA Observatory, Haleakala, Hawaii.

Foreign experimenters will also be encouraged to use the LRRR. Table 1-1 shows the experiments to be included in each ALSEP.

Table 1-1. ALSEP Experiments

Experiment	ALSEP Flight Article 1	2	3	4
PSEP	X	X	X	X
ASE				X
LSM	X			
SWS	X			
SIDE/CCGE	X		X*	X
HFE			X	
CPLEE			X	X
LRRR		X		

*CCGE only

1.3 MISSION OBJECTIVES

1.3.1 ACQUISITION OF DATA

Continuous acquisition of data will be required from ALSEP. Each ALSEP will require up to 2 years of support by the MSFN. The MSFN stations should have a turnaround capability of approximately 2 hours to switch from an operational mission to support of ALSEP (the 2-hour turnaround is to emphasize that no major station reconfiguration is necessary). USB 30-foot stations are prime for ALSEP support except during the ASE on ALSEP 4 when 85-foot MSFN stations will be required for ASE support.

1.3.2 MSFN SUPPORT

Continuous MSC and MSFN support of ALSEP 1, 3, and 4 will be required for the first 45 days after deployment. ALSEP 2 will require continuous support only during the lunar day (14 ± 2 consecutive earth days). Support will be required for approximately 2 hours per day after the initial 45-day support period for ALSEP 1, 2, 3, and 4. The specific 2 hours per day is not critical but must be continuous. It is desirable that the internal-time 12-hour activation occur during the 2 hours of continuous monitoring. This will also apply to ALSEP 2 during the lunar day.

1.3.2.1 Terminator Crossings. Continuous coverage is required for ALSEP 1, 3, and 4 during each terminator (sunrise and sunset) crossing for the duration of the mission after the first 45 days of coverage. Terminator crossings cause severe thermal transients.

1.3.2.2 Recording. Telemetry recording of all ALSEP data is required. Recordings will be returned to MSC for decommutation and distribution as specified by the Lunar Surface Project Office (LSPO).

1.3.2.3 Supporting Stations. Table 1-2 shows the supporting stations and indicates the support to be provided by each station.

Table 1–2. ALSEP Supporting Stations and Equipment Configuration

System / Facility	USB ant. for TLM Updata & Tracking			HS TLM Data	Voice (SCAMA)	TTY	ALSEP RSDP
	85' Dual	30' Single	30' Dual				
MSC					X	X	
MSFNOC					X	X	
ACN			X	X	X	X	X
ANG		X		X	X	X	X
BDA		X		X	X	X	X
CRO			X	X	X	X	X
CYI		X		X	X	X	X
GBM		X		X	X	X	X
GYM			X	X	X	X	X
GDS	X			X	X	X	X
GWM			X	X	X	X	X
HAW			X	X	X	X	X
HSK	X			X	X	X	X
MIL			X	X	X	X	X
MAD	X			X	X	X	X
TEX		X		X	X	X	X

Note

1. ANG, GBM, and GYM, will not be configured to support EASEP.
2. GDS, HSK and MAD will be required for ALSEP 4 HBR support.

SECTION 2. RESPONSIBLE ORGANIZATIONS

2.1 MANNED SPACECRAFT CENTER

The MSC has project management responsibilities for ALSEP. In this capacity, MSC assumes operational control of those elements of the MSFN committed to support ALSEP by GSFC. The scope of MSC responsibility is defined as the initial period of time that real-time data will be required, the 2 hours per day real-time period, and the terminator crossing periods required for the life of the ALSEP missions.

2.2 GODDARD SPACE FLIGHT CENTER (GSFC)

The GSFC is responsible for the engineering, operation, maintenance and scheduling of the MSFN for support of ALSEP. GSFC will designate the MSFN stations for ALSEP support according to requirements generated by MSC.

SECTION 3. NETWORK OPERATIONS

3.1 MISSION PERIOD OPERATIONS

3.1.1 GENERAL

This section designates the network operations procedures which will apply to ALSEP. For all network operations procedures not covered in this Annex, refer to Section 3 of the NOD.

3.1.2 MISSION STATUS

The network will be considered on mission status for ALSEP when Instrumentation Support Instruction (ISI) No. 1 is issued by the network director. ISI No. 1 for ALSEP will be issued at the termination of the associated Apollo mission.

3.2 NETWORK OPERATIONAL CONTROL

The MSFN has been subdivided into three phases for operational clarification. An explanation of the three phases follows.

3.2.1 PHASE 1 APOLLO MISSION PERIOD

Phase I occurs during the associated Apollo mission support and is defined as the period from Apollo liftoff until Apollo termination (see figure 3-1). During this period, the following criteria shall be observed:

a. MCC will exercise operational control of the supporting station (s) through the Apollo NC or the ALSEP NC.

b. All commands will originate from MCC.

c. Real-time TLM will be transmitted to MCC.

d. Station support will be identified by MCC and scheduled by the GSFC.

e. MCC will originate a Site Configuration Message (SCM) identifying ALSEP support.

Note

The basic operational interface in this period will be between the MCC Apollo/ALSEP Network Controller (NC) and the GSFC Apollo/ALSEP Network Operations Manager (NOM). For further interface definition and operations responsibilities, refer to Section 3 of the NOD.

3.2.2 PHASE II POST APOLLO REAL-TIME OPERATIONS

This phase occurs after Apollo terminating ISI has been issued and ISI No. 1 for ALSEP support has been issued (see figure 3-2). It will include the support requirements for the 45-day real-time, 2-hours per-day continuous support and terminator crossing periods. During this period, the following operational support guidelines will be in effect:

a. MCC will exercise operational control of the supporting stations.

b. All commands will be initiated from MCC.

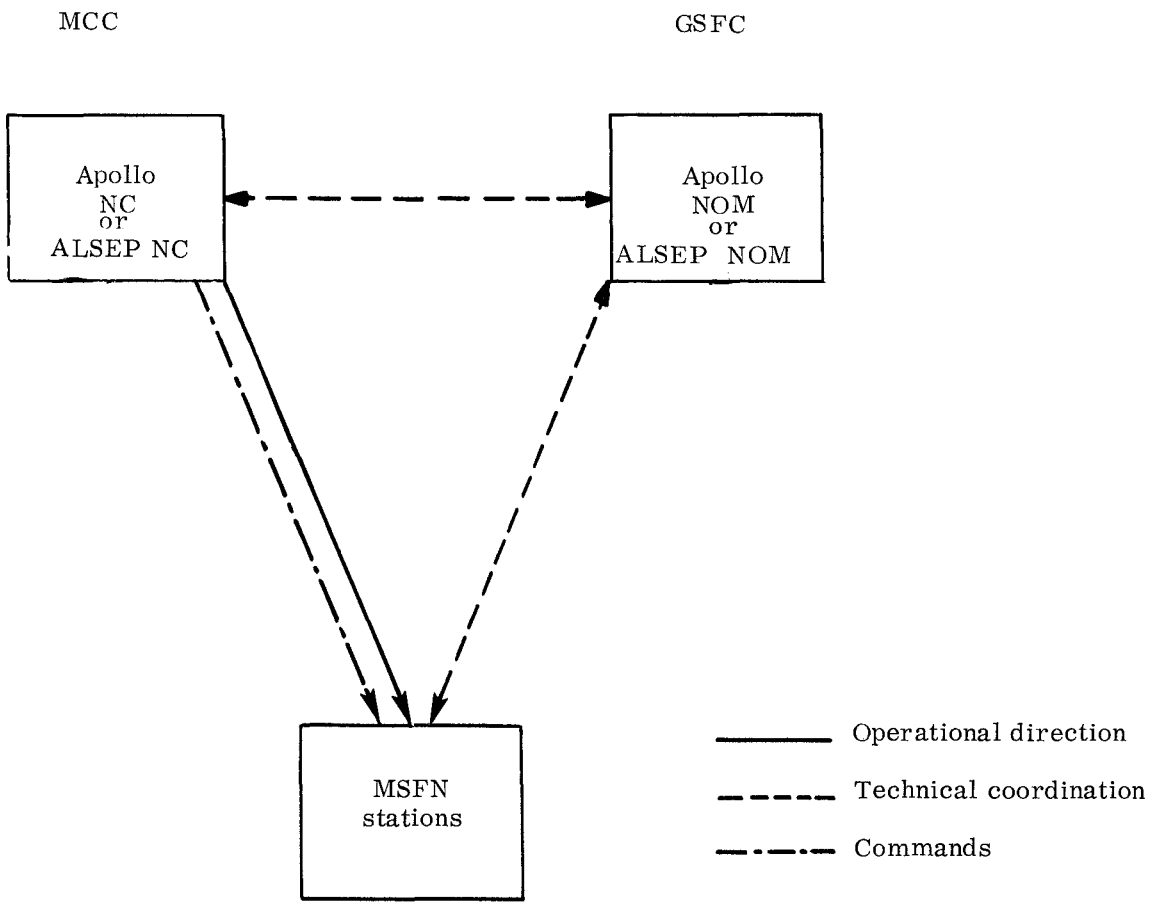


Figure 3–1. Phase I, Apollo in Progress

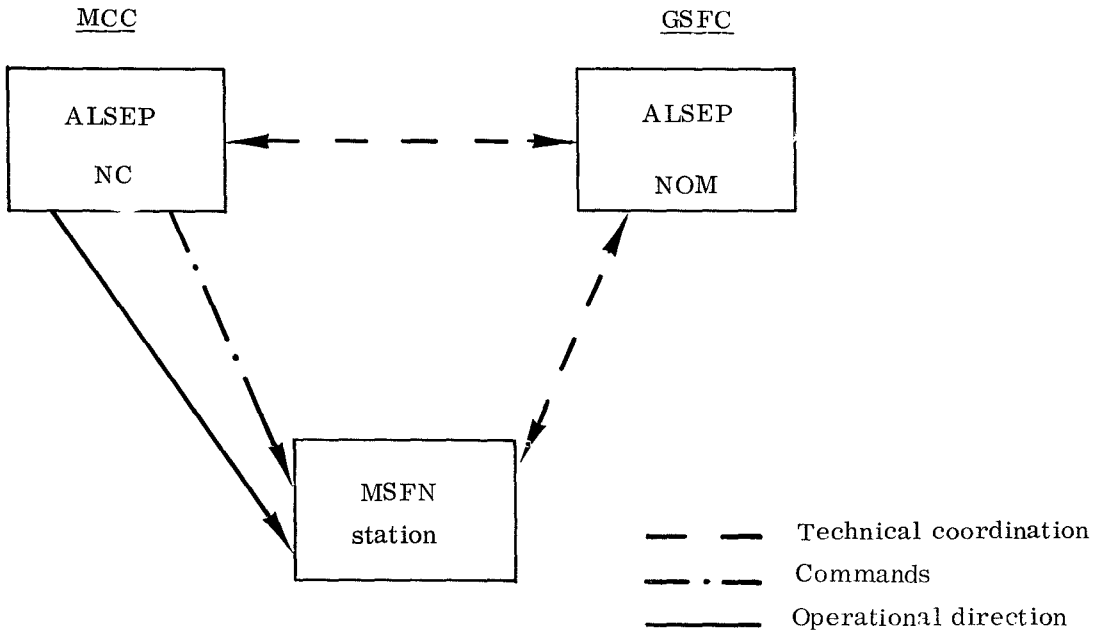


Figure 3–2. Phase II, Real–time Telemetry and Command

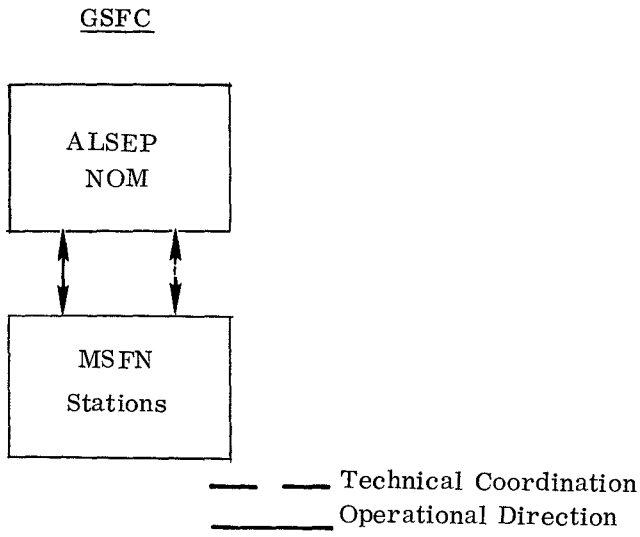


Figure 3–3. Phase III, Receive and Record

c. Real-time TLM will be transmitted to MCC.

d. Station support will be scheduled by GSFC.

e. MCC will originate a SCM identifying ALSEP support.

Note

The basic operational interface during this period will be between MCC ALSEP NC and GSFC ALSEP NOM. During scheduled activities, operational direction to supporting station(s) will be exercised through the MCC ALSEP NC. Technical coordination will be exercised through GSFC ALSEP NOM in accordance with the following criteria:

(1) The ALSEP NC will ensure that MCC scheduling responsibilities as outlined in Section 31 of this Annex are met.

(2) The ALSEP NOM, utilizing MSFNOC scheduling resources and MSFNOC tracking schedule, will establish all required voice data circuits deemed necessary for support (see figure 51-1). These circuits will be established no later than H -30 minutes.

(3) The ALSEP NC will be responsible for initiating any change in command modes and informing the station M&O.

(4) USB handovers will be made according to the scheduled time line.

3.2.3 PHASE III RECEIVE AND RECORD OPERATIONS

This phase covers the life of the ALSEP during which time the stations will be required to receive and record data (see figure 3-3). The following guidelines will be in effect:

a. GSFC will exercise operational control of the supporting station(s).

b. Station support will be scheduled by GSFC.

Note

The basic interface during this period will be between ALSEP NOM and the supporting station M&O. All operational direction and technical coordination will be exercised through ALSEP NOM. Interface of MCC ALSEP NC/GSFC ALSEP NOM will be on an "as required" basis and may be initiated by either NC or NOM.

3.2.4 STATION OPERATION INTERFACE

The operational interface at stations has two aspects:

a. The interface between the station M&O and NOM.

b. The interface between the station M&O and NC.

The traffic and voice exchanges concerning network operations during Phase I and Phase II will be between the station M&O and the Apollo/ALSEP NC. Traffic and voice exchanges concerning network operations during Phase III will be between the station M&O and ALSEP NOM.

3.2.5 MSFNOC H -50 MINUTE ACTIVITIES

H -50	NOM, M&O	NOM sets up voice conference with station M&O.
	NC	NOM sets up voice coordination loop GOSS 11/ SCAMA 22 with ALSEP NC.
	NOM, M&O	M&O passes verbal ASRT and station GO/NO GO status report to the ALSEP NOM.
H -40	NOM, NC	NOM briefs NC on station status. NC briefs NOM on pass activities.
H -30	NOM, M&O	NOM briefs M&O on current pass activities.
	NOM	NASCOM network interface established.
	Comm Mgr	Comm mgr reports status to NOM on CCL 25.
H -25	NOM, Comm Mgr, M&O NC	NOM places NC in voice conference with station M&O.
H -20	NC, M&O	MCC starts CMD interface.
H -0	M&O	Station acquisition.

3.2.6 STATION RELEASE MESSAGE (RLS)

3.2.6.1 Phase I. During Phase I operations, Sections 3 and 33 of the NOD will be used as a basis for preparation and formatting RLSs.

3.2.6.2 Phase II and III. All RLSs will originate from ALSEP NOM immediately upon completion of scheduled activities. These RLSs may be made by teletype or verbally at the discretion of NOM. See Section 33 of this Annex for TTY header and format.

3.2.7 STATION BRIEFING

Verbal station briefing will be used as required by ALSEP NOM during Phases II and III to define operational activity and will take place at H -30 immediately after NC briefing of NOM.

SECTION 10. DOCUMENTATION

10.1 GENERAL

This section designates the documentation procedures that will apply to ALSEP. For all documentation procedures not covered in this Annex, refer to Section 10 of the NOD.

10.2 OPERATION DOCUMENTATION

10.2.1 Documentation applying to ALSEP from Apollo TSI No. 1 until the Apollo terminating ISI will use the following criteria:

a. It will be sent reflecting itself as part of the associated Apollo mission, e.g., (NCG-725/785).

b. RICs, queries, etc, will be answered by ALSEP NST through Apollo NST.

c. Those ISIs written against ALSEP during the Apollo period (TSI No. 1 to mission terminating ISI) that are applicable, will be incorporated into ALSEP Annex C.

10.2.2 Revisions and changes to this document will be made as described in Section10 of the NOD, with the following additions/changes:

10.3 INSTRUMENTATION SUPPORT INSTRUCTION (ISI)

ISIs will be issued to implement and terminate mission status, and to correct, modify, or clarify mission support requirements and documentation. Stations will accomplish ISIs as received or will respond by RIC if they cannot be accomplished.

10.4 REQUEST FOR INSTRUMENTATION CLARIFICATION (RIC)

RICs will be issued by participating stations while on mission status to request information on all items relating to mission and instrumentation support. RICs should be sent to GUNV/ALSEP NOM with information copies to all participating stations.

Note

RIC answers will be sent to the originating station M&O with information copies to all participating stations. RIC answers will not be used to issue directions.

10.5 MESSAGE HEADERS

Refer to Section 33 of this Annex for message headers and formats.

SECTION 31. SCHEDULING

31.1 GENERAL

The applicable portions of Section 31 of the NOD with the following additions/changes will be used as a basis for scheduling all ALSEP support.

31.2 MISSION SCHEDULING

No later than 1600 GMT each Wednesday, FOSO will submit its ALSEP schedule inputs to the MSFNOC by teletype. At least 3 days prior to the associated Apollo mission termination, FOSO will provide MSFNOC with a 2-week ALSEP schedule forecast and will update the forecast with its weekly schedule input. Thereafter, FOSO will submit an ALSEP schedule forecast on a bi-weekly basis and update it with its weekly schedule input. The ALSEP schedule forecast will contain the following:

a. Block time for real-time operations

b. Block time for terminator crossing support

c. Special support requirements

All scheduled ALSEP support will be reflected in the NCG weekly tracking schedule.

SECTION 32. REPORTING

32.1 GENERAL

The applicable portions of Section 32 of the NOD, with the following additions/changes, will be used as a basis for reporting all ALSEP support.

32.1.1 REQUIRED REPORTS

The following reports will be required:

a. Station status reports

b. Postpass summary message

32.1.2 STATION STATUS REPORTS

Daily mission status reports will not be required. The weekly update or daily update station status reports will be used to reflect the stations' capability of supporting scheduled ALSEP activities. "Red, cannot support" items impacting ALSEP should be flagged by the M&O and an immediate update be transmitted to GUNV/NOM.

32.1.3 POSTPASS SUMMARY REPORTING

A postpass summary report (PSRM) will be transmitted after each support period during all phases of mission support. PSRMs are required from all stations and within 3 hours after a station's end-of-pass, will be transmitted in accordance with Section 33 of Annex C.

SECTION 33. TELETYPE FORMATS

33.1 GENERAL

The applicable portions of Section 33 of the NOD, with the following additions/changes, will be used as a basis for preparation and formatting of messages.

33.2 STATION RELEASE MESSAGE (PHASE II AND PHASE III)

PP XXXX
DE GCEN XXXX
XX/XXXX
FM: NOM
TO: XXXX/M&O
RLS
RLS XXX NCG XXX

1. Date Time Group (GMT) station is released.

2. Date Time Group (GMT) of next required tracking period as scheduled (if applicable).

3. Identity of ALSEP requiring support (if applicable).

33.3 REQUEST FOR INSTRUMENTATION CLARIFICATION (RIC)

XX GUNV All Supporting Stations
DE XXXX
XX/XXXXZ
FM: M&O
TO: GUNV/ALSEP NOM
RIC
XXX RIC NR XX NCG-XXX

33.4 INSTRUMENTATION SUPPORT INSTRUCTION (ISI)

XX HOPS GUNV All Supporting Stations
DE GCEN XXX
XX/XXXX
FM: NOM
TO: PER THE MESSAGE ADDRESS
INFO/HOPS ALSEP NC
ISI
ISI NR XX NCG-XXX
SUBJECT: _____
ACTION: M&O/SYSTEM_____
. . . . . TEXT. . . . . .

33.5 SITE CONFIGURATION MESSAGE (SCM)

33.5.1 GENERAL

The post translunar injection (TLI) SCM will be used during Phase I and II operation to denote carrier on/off times downlink bit rate, and initialization instructions. The vehicle

column will reflect the ALSEP vehicle to be supported (A1, A2, A3, or A4), and the mode column will reflect the uplink and downlink modes.

Uplink Mode	Action
00	Carrier off
03	Command carrier on (base-band modulation for ALSEP)

Downlink Mode	Bit Rate
01	Contingency
02	Normal
03	High

Note

All SCM time references during Phase II will be in GMT instead of GET.

35.5.2 PRINTOUT

PP XXXX
DE HMSC
XX/XXXX
FM: ALSEP NETWORK
TO:XXXX/M&O
SCM

Time	Format	Vehicle	Mode	Notes
191:00:00*	1	A2	00.02.00	1
192:10:00*	1	A2	00.02.00	2
193:00:00*	1	A2	03.02.00	
196:30:00*	1	A2	00.02.00	3

Notes

1. AOS; initialize RSDP FMT 1 (1A, 2B)
2. Data on line
3. Data off line

*GMT will be used instead of GET for Phase II operation.

SECTION 35. DATA HANDLING

35.1 GENERAL

35.1.1 All recorded mission data will be identified, annotated, labeled, packaged, and shipped in accordance with Section 35 of the NOD. Deviations from these standard procedures are noted below.

35.1.2 All scheduled MSFN stations will ship recorded data which includes the magnetic tapes and appropriate flat records direct to MSC. The shipping address is given below.

35.1.3 Unless otherwise directed by MCC, recorded data for each scheduled tracking period will be retained on station for 24 hours after LOS of scheduled tracking period, then shipped.

35.1.4 Additions/changes or special instructions will be coordinated by GSFC NST/DSC.

35.2 DATA IDENTIFICATION

Instructions for completing MP 503 in paragraph 35.2.3 of the NOD apply with the following exceptions:

a. Mission Code: The NCG test number and post-activation day number (counting activation day as zero), e.g., 114/0.

b. Vehicle: ALSEP number as applicable.

35.3 SPECIAL SHIPPING INSTRUCTIONS

All data from each station should be packaged in one container (if possible) and shipped via expedited airfreight signature service (time specified above) to:

Manned Spacecraft Center
Central Metric Data File
Bldg 12, Room 133
Houston, Texas 77058
ATTN, ED-5

Shipments should be sent with the Air/Weight/Bill annotated as follows: "To be converted to GBL by the Transportation Officer, MSC, Houston, Texas." Shipments will be marked: "To be held at airport for pickup. Notify addressee of the arrival of shipment." Customs apply where applicable.

35.4 SHIPPING MESSAGE

All stations will transmit a teletype shipping message within 12 hours after a data shipment is delivered to a common carrier. Message will be addressed to MSC/ED-5 with information addressee GCEN/Code 824.3.

Note

If all information required in the shipping message (refer to paragraph 35.4.3.3 of the NOD) is not available at the time of transmission, a follow-up message will be sent as soon as this information becomes available.

SECTION 40. STATION OPERATING PROCEDURES FOR ALSEP

40.1 GENERAL

This section contains operating procedures that will apply to ALSEP. For all operating procedures not covered in this Annex, refer to Section 40 of the NOD. Where conflicts exist, procedures specified in this Annex will be used.

40.2 M&O SUPERVISOR

40.2.1 GENERAL

These procedures include specific instructions for:

a. Reporting nominal and contingency operations

b. On-station operations.

Note

As used in this section, all H times are in minutes.

40.2.2 OPERATING AND REPORTING PROCEDURES

40.2.2.1 General. The following paragraphs describe operating and reporting procedures to be used by M&O supervisors when they differ from the procedures used in the NOD.

40.2.2.2 Prepass

a. Station Readiness. Station M&O will follow station status reporting as outlined in Section 32 of this Annex.

b. Equipment Failures. Equipment failure is to be reported as indicated in Section 40 of the NOD, paragraph 40.2.2.2.8.

c. Acquisition Messages. Real-time acquisition messages may or may not be supplied.

A lunar almanac is available at all ALSEP supporting stations. A program to provide lunar designation data for the USB stations is being designed currently for use on the M642B computer. The program will use manually typed-in data taken from the American Ephemeris and Nautical Almanac, and produce 29-point acquisition messages for the 30-foot and 85-foot USB antennas.

Specifically, preliminary design calls for the type-in of the Greenwich hour angle which is subtended by the moon's radius, and hourly values for right ascension and declination of the moon. The program will interpolate the data, transform it to X and Y angles, and output 29-point messages for the 30-foot and 85-foot USB systems.

d. Radio Frequency Interference (RFI). RFI reporting will be in accordance with Section 32 of the NOD.

e. Station Status Events to MSC

(1) MSFN stations transmit station status events to MCC in the 2.4-kbps HS data stream. These status events (downlink PCM receiver lock, DTU in sync, etc.) are used by MCC to determine the station equipment status.

(2) All status event indications are automatic and need no operator actions on MSFN stations.

40.2.2.3 AOS Procedures

a. Announcements. AOS announcements will be made in accordance with table 40-1.

b. Status CAPs. After the M&O announces "go for command", he will initiate a CAM request for USB loop test. If USB uplink is lost, M&O will initiate a CAM request for USB loop test (CAM 988).

c. PCM Parameter Verification. MCC may request direct TLM parameter read-outs. Refer to Section 40 of the NOD.

d. Station Equipment Failure Contingencies. Refer to Section 40 of the NOD.

e. Vehicle Downlink Loss Contingency. Any loss of downlink signal to be reported as indicated in Section 32 of the NOD. The loss will be identified as one of the following:

(1) Modulation

(2) RF signal strength

f. PCM Bit Rate Change. When MCC generates a command to change bit rate and uplink is noted on station, M&O will announce on the M&O loop, i.e., "NBR (normal bit rate) on" or "CBR (contingency bit rate) on". This is done to facilitate switching of formats and bit synchronizer by the PCM technician. MCC may announce a bit rate change as it is initiated.

g. Station Data Playback

(1) MCC may request that the M&O play back telemetry data received from ALSEP. MCC will request the playback by giving:

(a) Vehicle

(b) GMT of recording

(c) Bit rate

(d) Playback bit (set or not set)

(e) Playback start time and duration cued within 1 minute

(f) High-speed data formats and slot assignments.

Table 40–1. M&O Typical Pass–time Announcements

Seq. No.	Conditions	Station	Announcement on Net 2
1	Upon acquisition of first vehicle RF signal	All	"(Station), AOS"
2	Prior to uplinking command, USB system will ensure that command carrier modulation is on	All	"(Station), go for command"
3	If the USB system is unable to command the vehicle	All	"(Station), unable to command"
4	When the last RF link is lost	All	"(Station), LOS"

Note

1. A station can be "Go for command" when the command carrier is on.

2. A station can be "Go for command" when solid PCM lock is not observed.

(2) The M&O will ensure that the following procedures are implemented by persons listed:

(a) M&O: Ensure station configured for playback and notify TIC.

(b) TLM technician: Start tape recorder on cue from M&O.

(c) TLM technician: Confirm solid decom lock and solid time code translator lock. Ensure that the time displayed on the translator is valid.

(3) At completion of the playback, ALSEP network will notify the M&O to reconfigure for real time or release the station to NOM.

40.2.2.4 Handovers. There will be no handovers between stations as done during the Apollo mission. Carriers will be brought up or down according to the SCM or NCG weekly schedule. Any real-time support for carriers to be brought up or down will be handled by the ALSEP NC.

40.2.2.5 LOS Procedures

a. LOS Announcement. LOS announcements will be made according to table 40-1.

b. Status CAPs. The M&O will initiate a CAM request for USB status CAP after the carriers are turned down.

40.2.3 M&O COMMAND OPERATING AND CONTINGENCY PROCEDURES

40.2.3.1 Processing Command Loads. Not required for ALSEP support.

40.2.3.2 Command

a. General. Command executes for RTCs will be initiated by MCC in Mode 2. Under no circumstances will the M&O switch to Mode 1 to initiate a command uplink unless directed by MCC.

b. Network Safe Procedures. The M&O SAFE/OPERATE switch is to be kept in the OPERATE mode at all times when the carriers are up, except when directed by ALSEP network to safe the command system.

c. Contingency CAM Operation. The following script provides examples of the sequence of events that will occur between the station M&O and MCC when the station is directed to switch to Mode 1, and uplink commands. The CAM uplink request procedure will be immediately terminated if a ground or S/C reject should occur or if the vehicle TLM link is lost. No further CAM requests will then be made until directed by MCC.

Note

Certain RTCs are disabled upon ALSEP program initialization. ALSEP NC will advise the station M&O which group/groups of critical RTCs will be used. The ALSEP NC will instruct the station M&O to go to Mode 1, M&O mode to enable or disable required critical RTC(s). Critical RTC uplink (Mode 1 or 2) will be the same.

Sequence	Position	Action and Remarks
1	MCC	"(Station), MCC , configure the ALSEP computer for Mode 1 commanding
2	(Station)	" MCC , (Station), roger ALSEP computer in Mode 1"
3	MCC	"(Station), MCC , request RTC XXX for ALSEP X DECODER X (with MAP override)"
4	(Station)	"(Station) roger"
5	(Station)	"(Station), roger, RTC XXX FOR ALSEP X DECODER X (MAP override) requested"
6	MCC	"(Station), MCC, uplink RTC XXX"
7	(Station)	"(Station), uplinking RTC XXX"
8	(Station)	" MCC , (Station), RTC XXX CMD verified"
9	MCC	If applicable "(Station), MCC go to Mode 2"
10	(Station)	" MCC , (Station), roger, in Mode 2"

40.2.3.3 Command CAM Operations

a. Command Histories

(1) End of File. At completion of Network Interface Testing (CMD/TLM-MCC/GSFC), an End-of-File (EOF) will be placed on the CMD history tape. This should be the last item placed on the history tape prior to a station coming up for ALSEP support.

Note

The Real-time Off-line ALSEP Command History (ROACH) program enables M&O to select CMD histories from previously recorded history tapes. (Refer to the "Software Catalog for the Apollo Network" for operating instructions.)

(2) Command History Requests. The station will take an on-line low-speed history following its support period if commands were uplinked.

Note

Stations will not take high- and low-speed histories simultaneously.

b. RTC Enable. Specific operating procedures are contained in Section 55 of this Annex.

c. RTC Clear. Specific operating procedures are contained in Section 55 of this Annex.

d. FC/M&O Mode. The computer will be operated in the FC mode unless required to go to the M&O mode to perform an MCC-requested function.

e. MAP Override. When requested by MCC, the MAP override function will be initiated. This will be required by MCC when command uplinks are to be initiated without requiring the computer to search for valid MAPs from the experimental package.

f. Mission CAM Code Listings. Section 55 of this Annex will list the CAM codes.

g. ALSEP System Constants. Prior to support, the M&O will be informed by MCC of ALSEP support constants. The M&O will direct the computer operator to insert specific constants during initialization. When initialization is complete, the program will print automatically an ALSEP parameter listing. M&O should verify that the constants are correct.

40.2.3.4 ABARF-6 or ABARF-11

a. If the computer faults and ABARF-X instantly reloads the operational program, the operator immediately will perform the computer recovery. M&O will then verify the parameter list, and report by voice to ALSEP NC.

b. If the computer faults, and ABARF-X or the command recovery program does not reload, the operator will immediately attempt to manually reload ABARF-X three times. M&O will then notify ALSEP NC immediately whether or not the attempt was successful. If it was not successful, M&O may recommend a course of action to the ALSEP NC.

c. Only procedures listed in paragraphs a and b will be used if the computer faults. The actions and subsequent report to ALSEP NC should be completed within 1 minute from computer fault.

d. Refer to SCAN for ABARF-X operating instructions.

40.2.3.5 Computer Contingency Procedures. Refer to Section 55 of this Annex.

40.2.3.6 Manual I/O Routines. Specific I/O routines and computer operating procedures are located in Section 55 of this Annex.

40.2.4 M&O ALSEP TLM OPERATING AND CONTINGENCY PROCEDURES

40.2.4.1 General

a. TLM HSD Formats. The computer can output two different HS TLM formats. M&O will direct the computer operator to change formats via 1232 at direction of MCC. HS TLM data output will be on Net 4.

b. Telemetry Manual Input/Output Routines. The 1232 typewriter will input system initialization constants and will access the program for performing manual I/O routines.

40.2.4.2 Operating Procedures

a. HS TLM Initiation. M&O will verify HS TLM output on at H -15. The on-station HS printer will indicate this activity and M&O should verify by negative reporting that HS data is leaving the station. The M&O will ensure that LOS-T is typed into the computer at LOS +5 minutes.

Note

Terminating HS TLM output does not affect transmission of validation CAPs. The computer will still output three iterations of VAL CAPs for each execute received at the station.

b. HS TLM Format Changes. M&O will initiate any HS TLM format changes by direction from MCC.

c. Formats for Initiation. MCC will notify the station which HSD formats to initialize.

40.2.5 TYPICAL PASS ACTIVITIES FOR M&O

Note

For all practical purposes, AOS time can be used as the carrier on-time and/or start of ALSEP support time. LOS can be used as the carrier off time and/or end of ALSEP support time.

Time	Station	Personnel	Activities
H -30	All	M&O	Confirm prepass console check-list complete. Announce voice recorders on (station option). Confirm station configured according to SCM and/or tracking schedule and ALSEP Annex.
	All	M&O	Select CAM for ALSEP parameter listing and verify Mode 2, F/C. Confirm variable constants.
	All	M&O	Check each system for a GO indication. Log all red items.
	All	M&O	Receive briefing from NOM on current pass activity; give GO/NO GO voice status.
H -28	All	M&O	Verify tracking system can autotrack boresight tower.
H -20	All	M&O	Start GSFC/MCC command interface test.
H -15	All	M&O	Confirm system status, recorders loaded, prepass cals, prepass checklist, SDT checklist, and SDT checks are completed. Set horizon clock to expected AOS. Confirm APP loaded with acquisition tape. Confirm TLM data output.

Time	Station	Personnel	Activities
H -10	All	M&O	Give prepass briefing from tracking schedule. Confirm, via negative reporting from systems, that all local signal sources of RFI are off and no outside interference is present. Clear operating areas of all non-operating personnel.
H -8	All	M&O	Confirm that antenna is pointing to initial point (IP).
H -5	All	M&O	Set SAFE/OPERATE switch to OPERATE.
H -3	All	M&O	Reconfirm with GCC that data links are configured.
H -2	All	M&O	On paging system, announce "Two minutes to acquisition, all data recorders on."
H -0	All	M&O	Announce to systems, "Carrier on" (if applicable). Verify that status display shows system is radiating. Announce "Go for command" and make AOS announcement on Net 2. Log contact time.
AOS +	All	M&O	Monitor HS printer for commands to change PCM bit rate. Announce all bit rate changes on M&O loop.
	All	M&O	Initiate status CAP when "Go for command".
AOS +1	All	M&O	Confirm with GCC that data is on line to MCC. Monitor status lights and loops for problems.
LOS (premature)	All	M&O	Announce LOS of any link on Net 2. Log GMT. Attempt to reacquire the vehicle signal.
LOS (nominal)	All	M&O	Announce LOS on Net 2. Log GMT.
LOS +2	All	M&O	Obtain system status from system supervisors. Announce to data recorders on M&O loop, "Data recorders off." Announce on M&O loop, "Carrier off."
	All	M&O	Initiate CAM request for USB status CAP.

Time	Station	Personnel	Activities
LOS +5	All	M&O	When directed to type LOS -T, verify HS TLM data terminated. Set SAFE/OPERATE switch to SAFE.
LOS +10	All	M&O	Announce voice recorders off. Lift station security.
	All	M&O	Execute appropriate CMD histories on line.

SECTION 50. COMPUTER SUPPORT

50.1 GSFC SUPPORT

Real-time acquisition messages will not be supplied. However, the Manned Space Flight Planning and Analysis Division (MFPAD) will provide the following support:

a. Each week from July 7, 1969, until ALSEP-2 termination or projected shutdown times, the MFPAD will generate for the following week 29-point acquisition messages for the moon's center for supporting stations at BDA, CYI, ACN, MIL, MAD, CRO, HSK, GWM, HAW, GDS, and TEX.

b. Every Friday, MFPAD will transmit 29-point acquisition messages to those stations for each pass scheduled to be supported during the following week.

c. A hard copy of each message transmitted will be provided to the NOM each Friday.

50.2 STATION-GENERATED POINTING DATA

A lunar almanac will be available at all ALSEP supporting stations. Stations which are called up for support of ALSEP-2 after transmission of the weekly tracking schedule each Thursday will generate their own acquisition data. A program to provide lunar designation data for the USB stations is currently being designed for use on the M642B computer. The program will use manually typed-in data taken from the "American Ephemeris and Nautical Almanac", and produce 29-point acquisition messages for the 30-foot and 85-foot USB antennas. Specifically, the preliminary design calls for type-in of the Greenwich hour angle which is subtended by the radius of the moon, and hourly values for the right ascension and declination of the moon. The program will interpolate the data, transform it to X- and Y-angles, and output 29-point messages for the 30-foot and 85-foot USB systems.

SECTION 51. COMMUNICATIONS

Section 51 of the NOD is applicable to ALSEP with the following additions:

a. Voice conferencing will be accomplished at the GSFC SCAMA facility under direction of ALSEP NC or NOM.

b. Mission traffic will originate from MSFNOC and commands from MCC. Messages will include in the first line of the text: mission traffic identification, NCG test number, and mission identification e.g., USB, NCG-XXX, ALSEP.

c. Table 51-1 represents network configuration for Phases II and III of ALSEP support.

Table 51-1. Network Configuration

Station	Net 2	Net 3	Net 4	NST/IST Coord	TTY A	TTY B
ACN	X	X	X		X	X
ANG	X	X	X		X	X
BDA	X	X	X		X	X
CRO	X	X	X		X	X
CYI	X	X	X		X	X
GBM	X	X	X		X	X
GDS	X	X	X		X	X
GWM	X	X	X		X	X
GYM	X	X	X		X	X
HAW	X	X	X		X	X
HSK	X	X	X		X	X
MAD	X	X	X		X	X
MIL	X	X	X		X	X
TEX	X	X	X		X	X
MSC	X		X	X	X	X
NOC	X	X	X	X	X	X

Note

1. Phase II will require Nets 2, 3, 4, and GOSS 11 voice/data circuits at not more than two stations at one time.

2. Phase III will require Net 3 to one station, and GOSS 11 as required.

3. During Phase II operations (real-time), there will be two voice circuits and one data circuit going to no more than two stations. (See paragraph 1.3.2 for description of support.)

4. During Phase III operations (receive/record), there will be one voice circuit to one station. (See paragraph 1.3.2 for description of support.)

SECTION 54. UNIFIED S-BAND

54.1 GENERAL

USB system support will be provided by ACN, ANG, BDA, CRO, CYI, GBM, GDS, GWM, GYM, HAW, HSK, MAD, MIL, and TEX. Support will consist of transmitting commands and providing of telemetry data to other on-station systems for processing, recording, on-station distribution of specific parameters, and transmission off station.

54.2 USB UPLINK

54.2.1 ALSEP commands will be phase-modulated directly onto the 2119-MHz uplink carrier. The uplink carrier is derived by setting the USB frequency synthesizer (substitutes for exciter VCO) to 22.072917 MHz which is multiplied by 96 in the exciter. The signal path from the exciter is the same as for the Apollo program except that discriminators in the verification receiver have been bypassed. The USB uplink configuration is shown in figure 54-1. It should be noted that a phase reversal exists on the composite uplinks and the output of the verification receiver is reversed.

54.2.2 When preparing the uplink modulation index, the frequency synthesizer is set to an MSFN frequency. Using the wave analyzer and the digital voltmeter, it is possible to set the carrier deviation for 3 radians by adjusting uplink modulation level for a corresponding setting on the digital voltmeter of 0.169 volts. This is the only method of achieving peak carrier deviation since there is an unusual characteristic of the modulating signal. The synthesizer is then set to the ALSEP frequency.

54.2.3 The power amplifier must be broadband tuned ±2.5 MHz about 2117 MHz.

54.3 USB DOWNLINK

54.3.1 DOWNLINK PARAMETERS

54.3.1.1 The downlink frequencies assigned to individual ALSEPs are:

ALSEP No.	Frequency (MHz)
1	2278.5
2 (EASEP)	2276.5
3	2275.5
4	2278.5

54.3.1.2 The split phase telemetry downlink will be directly phase modulated on the S-band carrier. The bit rates associated with the telemetry modes are as follows:

Mode	Bit Rate (kbps)
Contingency	0.530
Normal	1.060
High	10.600*

*Used with the active seismic experiment on ALSEP No. 4 only

54.3.1.3 The downlink modulation index will be 1.25 radians.

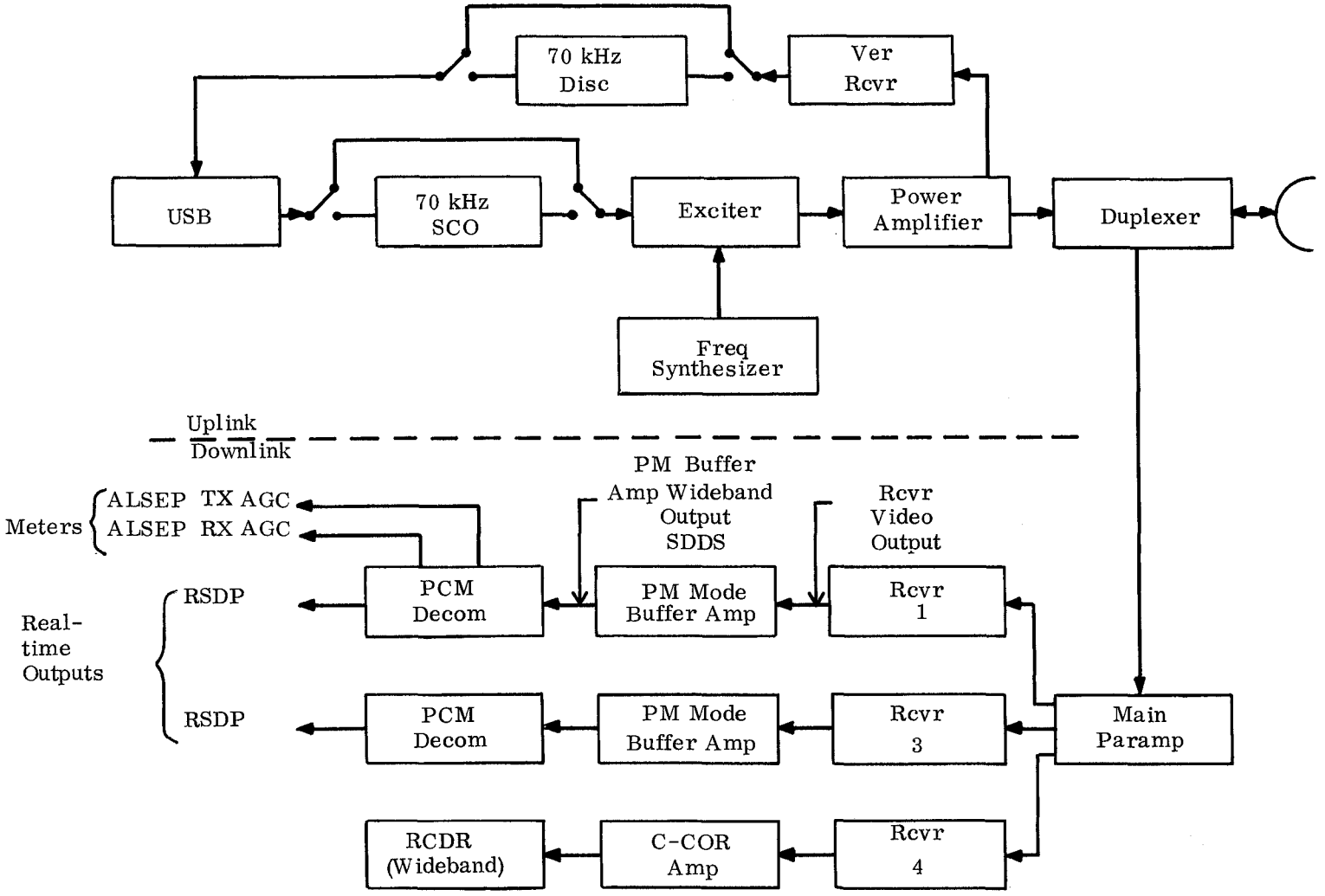


Figure 54–1. USB Configuration for ALSEP Support

54.3.2 RECEIVERS

54.3.2.1 Each receiver used for ALSEP must have the receiver AGC phase shifter peaked at the appropriate ALSEP downlink frequency.

54.3.2.2 Receiver telemetry bandwidths to be used will depend upon the downlink telemetry bit rate. Thus, the telemetry phase shifter must be peaked for each bandwidth used. The bit rates and corresponding bandwidths are:

Bit Rate (kbps)	Receiver Telemetry Bandwidth (kHz)
0.530 or 1.060	4.5
10.600	420

Note

Zero receiver SPE should be maintained during the track.

54.4 TESTS

The ALSEP SRT should be performed prior to mission support. This test requires that all prerequisite STs and SSTs have been completed.

54.5 MONITOR CALIBRATION PROCEDURES

54.5.1 RECEIVER AGC

Receiver AGC calibrations will be performed according to Section 54.4.6.1 of the NOD.

54.5.2 RECEIVER SPE

Receiver SPE calibrations will be performed, using MSFN frequencies, according to section 54.4.6.2 of the NOD.

54.5.3 RECEIVER ACQUISITION VOLTAGE

Receiver acquisition voltage calibrations will be performed according to Section 54.4.6.5 of the NOD.

54.5.4 MAIN X- AND Y-ANGLE ERRORS

Main X- and Y-angle error calibrations will be performed according to Section 54.4.6.6 of the NOD.

54.5.5 TRANSMITTED POWER OUTPUT

Transmitted power output calibrations will be performed according to Section 54.4.6.8 of the NOD.

54.5.6 PROGRAM X- AND Y-ERROR

Program X- and Y-error calibrations will be performed according to Section 54.4.6.12 of the NOD.

54.5.7 ALSEP RECEIVER AGC (RECEIVER PRELIMIT LEVEL)

ALSEP receiver AGC calibrations will be performed according to Section 54.4.6.13 of the NOD.

54.6 SYSTEM CHECKLIST

On-station verification that individual USB equipment system checklists have been completed prior to each mission station support period is mandatory. The following paragraphs specify the system checklists required.

54.6.1 ANTENNA/SERVO SYSTEM

Unit/Function	Indication/Setting
a. Warning Control Panel	
Antenna drive key	ON
b. Servo Amplifier Rack	
(1) Antenna safety key	NORMAL
(2) EMERGENCY STOP-PULL to RESET pushbutton	RESET (Pulled)
(3) 10 EMERGENCY STOP-PULL to RESET pushbutton on the antenna structure	RESET (Pulled)
(4) Switch S1, AZ-EL to X-Y converter (in back rack)	N/A
(5) DC null voltmeter toggle switch	ON
c. Wind Direction and Velocity Indicator Panel	
ON/OFF toggle switch	ON
d. TV Camera Control Panel	
(1) POWER ON/OFF switch position for TV system	ON
(2) POWER ON/OFF switch for camera and lens system	ON
(3) POWER ON/OFF switch for TV monitors	ON
(4) MANUAL/AUTO switch	MANUAL
e. Error Monitor and Slave Selector Panel	
(1) Selector switch when acquisition receiver is to be used	ACQ TRK
(2) Selector switch when main receiver is to be used	AUTO TRK X 0.1

Unit/Function	Indication/Setting
(3) Selector switch when main program is to be used	PROGRAM
(4) Selector switch when VHF acquisition aid is used	N/A
f. Servo Control Panel	
(1) EMERGENCY pushbutton switch	RESET
(2) Bandwidth selector switch to:	
(a) When in acquisition mode	X.5
(b) When in autotrack mode	X1.0
(3) Scale selector for X- and Y-axis error	1
(4) POWER ON pushbutton	ON
(5) Manual position pushbutton	Lit
(6) BRAKE pushbutton	Not lit
(7) X- and Y-axis disable indicators	Not lit
g. Spectrum Display	
(1) Power	ON
(2) Receiver	1
(3) Display	Log
(4) Bandwidth	3.5 kHz
(5) Variable controls	Adjust to display ±200 kHz about the carrier. Gain control should be adjusted to provide the best carrier display at -130 to -133 dbm or for maximum threshold.

54.6.2 RECEIVER EXCITER

a. Exciter Console

Note

Transmitter drive OFF until required.

(1) Acquisition Control Panel Switch Settings

(a) Spacecraft position — Zenith

Unit/Function	Indication/Setting
(b) Bias bandwidth	Medium
(c) RCVR 1	MSFN
(2) Synthesizer	
ALSEP support	22.072917 MHz
(3) Scope Monitor	N/A
(4) Frequency Counter	EXC VCO
(5) Exciter Control Panel	
(a) Transmitter drive	OFF
(b) Test translator	OFF
(c) Modulation selector	ALSEP
(d) Ranging modulation	OFF
(e) Doppler extractor	N/A
(f) Data condition	N/A
(g) Doppler condition	N/A
(h) Exciter VCO selector	*
(i) Acquisition sweep	RCVR 1
(j) Synthesizer loop filter	SHORT
(k) Manual acquisition control	N/A
(l) Sweep amplitude	OFF
(6) Function Generator	N/A

Unit/Function	Indication/Setting
(7) Limit Switch Settings	
(a) ALSEP RCVR AGC	-65 to -115 dbm
(b) ALSEP TX AGC	Max & Min
b. Receiver 1 Console Switch Settings	
(1) Spectrum Display	
(a) Power	ON
(b) Receiver	RCVR 1
(c) Display	Log
(d) Bandwidth	3.5 kHz
(2) Scope Monitor	RCVR 1 DYN PH
(a) Vertical sensitivity	2 volts/cm
(b) Sweep time/cm	2 M sec
(c) Horizontal display	X1

Note

When downlink is observed, tune RCVR for best square wave.

(3) Range Receiver Control Panel	N/A
(4) VTVM Monitor	RCVR 1 AGC
(5) Frequency Counter	RVCR 1 VCO
(6) Receiver 1 Control Panel	
(a) Telemetry bandwidth	4.5 kHz ALSEP 1, 2, 3, & 4 420 kHz ALSEP 4, during HBR
(b) AGC bandwidth	NARROW
(c) Receiver loop bandwidth	NARROW
(d) VCO select	No. 2
(e) Manual gain control	N/A
(f) Gain control selector	AGC

Unit/Function	Indication/Setting
(g) Receiver loop filter	OPER
(h) Acquisition control	
1. Switch acquisition sweep selector on the exciter console	OFF
2. Adjust RCVR 1 acquisition control with loop filter MOM SHORT pushbutton depressed until the frequency counter reading concurs with the applicable operating frequency stated in steps (6) (d).	
(i) Antenna	Cooled, on RCVR 1
(7) Audio Monitor. Set one channel to monitor RCVR 1. Set levels as required.	
(8) Test Signal Control Panel. All switches should be set as indicated.	OFF
(9) Isoamp Cabinet. It is assumed that all isoamps and system power supplies have been adjusted to concur with other procedures	

Note

All isoamp and power supply monitor switches should be in the SHORT position during tracking operations.

54.6.3 RANGING SUBSYSTEM CONSOLE

Not applicable.

54.6.4 APP

a. Local Control Panel

(1) Program Control Indicators

(a) REMOTE/LOCAL	M&O option
(b) COMPUTER READY	Lit
(c) MANUAL	Not lit
(d) COMPUTER/TAPE	COMPUTER or TAPE*
(e) AUTO/PROGRAM (switch indicator)	PROGRAM
(f) ADD ERROR (switch indicator)	Not lit
(g) STORE ERROR (switch indicator)	Not lit
(h) OFFSET ANGLES (switch indicator)	Not lit
(i) ADD TIME (switch indicator)	Lit
(j) TAPE TIME AHEAD	Lit
(k) READY/TEST	Not lit

(2) Tape Control

(a) READ ONE WORD (switch indicator)	Not lit

*Dependent upon availability of data sources

Unit/Function	Indication/Setting
(b) STOP READER (switch indicator)	Not lit
(c) START SEARCH (switch indicator)	Lit
(3) APP Local Control Panel Switches	
(a) ENCODER SIMULATOR X-ANGLE	+00.000
(b) ENCODER SIMULATOR Y-ANGLE	+00.000
(c) ADD TIME	00:00:00
(d) REAL ANGLE SOURCE	ENCODER
(e) CONTROL MODE	M&O option
(f) COMMAND DATA SOURCE	COMPUTER or TAPE*
(4) APP Remote Control Panel	
(a) REMOTE LOCAL	M&O option
(b) COMPUTER READY	Lit
(c) MANUAL	Not lit
(d) COMPUTER/TAPE	COMPUTER or TAPE*
(e) ADD ERROR (switch indicator)	Not lit
(f) STORE ERROR (switch indicator)	Not lit
(g) OFFSET ANGLES	Not lit
(h) ADD TIME	Lit
(i) REAL ANGLE DISPLAY RATE	1 pps
(j) COMMAND DATA SOURCE	COMPUTER or TAPE*
(k) COMMAND/OFFSET ANGLES X-ANGLE	+00.000
(l) COMMAND/OFFSET ANGLES Y-ANGLE	+00.000
54.6.5 RF CONTROL CONSOLE	
a. Test Transmitter OFF/ON Switch	OFF
b. SCO No. 1 Mode Switch	1 C/ALSEP mod on
c. ALSEP Test/Operate Switch	OPERATE

*Dependent upon availability of data sources

Unit/Function	Indication/Setting
d. Main Antenna Polarization Control Panel	
(1) LHC/RHC control switches	RHC
(2) Waveguide pressure warning lights	Not lit
e. Acquisition Antenna Polarization Control Panel	
f. Collimation System Control Panel	
(1) Transponder power	STANDBY
(2) Boresight transmitter power	STANDBY
g. Acquisition Receiver Paramp Selector Panel	
h. Main Paramp Control Panel	
(1) Power ON/OFF switch	ON
(2) STANDBY/OPERATE switch	OPERATE
i. Noise Figure Meter	
Power ON/OFF switch	OFF
j. Noise Figure and Test Signal Control Panel	
Mode switch	OFF

54.6.6 POWER AMPLIFIER

a. Beam Voltage Safety Switch (3)	RUN
b. PA System	ON
c. RF Load	ANTENNA
d. Beam Voltage	ON
e. All Fault Indicators and Battle Short Lights	Not lit

Note

Beam voltage will be set to 20 kV and drive will be adjusted for operational value for the required uplink carrier power.

54.6.7 SYSTEM MONITOR

Unit/Function	Indication/Setting
a. AC Power	ON
(1) 28 volt power supply AC power	ON
(2) 28 volt power supply output	OUT
b. Data Converter/FM Multiplexer System	
(1) AC power	ON
(2) Power supply positive and negative lights	Lit
(3) Input selector switches	NORMAL
(4) VCO out/mixer input selector switches	1
c. Analog Data Recorders I, II, and III	
(1) Interlock warning light	Not lit
(2) Control mode	Local
(3) Chart speed	Stop*

Note

*Chart speed selection will be changed from STOP to 2 mm/sec when required.

(4) X.01 button	Not pressed
(5) Paper supply	800 feet or more
(6) Event marker switch	EXTERNAL
d. Preamplifier	
(1) Sensitivity control	Set during calibration
(2) Polarity reversal switch	Set during calibration
(3) Zero suppression range control	Set during calibration
(4) Sensitivity X1 dial	Set during calibration
e. Event Recorder	
(1) Interlock warning light	Not lit

Unit/Function	Indication/Setting
(2) Control mode	ON
(3) Chart speed	STOP*
(4) X.01 button	Not pressed
(5) Paper supply	500 feet
(6) Event marker switch	
(a) Left	External
(b) Right	External

Note

*Chart speed selection will be changed from STOP to 2 mm/sec when required.

54.6.8 VERIFICATION RECEIVER

a. Crystal installed	ALSEP
b. Demodulator installed	PMD-120A-1

54.7 USB ANALOG FUNCTIONS

Section 54.3.2 of the NOD applies with the following exceptions:

Analog Function	System No. 1	System No. 2
ALSEP RCVR AGC	A7 B7	E7 F7
ALSEP TX AGC	C7 D7	G7 H7

54.8 RECORDERS

54.8.1 GENERAL

All analog and event recorders will be run at a speed of 2mm/sec. Recording paper for the event recorder is available in 500-foot rolls and analog recorders must use 850-foot rolls. At specified recorder speeds, one roll of chart paper is sufficient to record the complete view period. To maintain a continuity of calibrated recorded data, specific procedues will be observed.

54.8.2 SYSTEMS MONITOR RECORDING ASSIGNMENTS

At AOS-2 minutes, when the announcement is made to start recorders, the ALSEP designated recorder will be started. Recording assignments are as follows:

Event/Signal	Analog	Event
NASA 28-bit time code (1/min)		E1 and E9
Rcvr No. 1 SPE	A1	
Rcvr No. 1 VCO select 2 (on)		E2
Rcvr No. 1 AGC	A2	
Rcvr No. 1 AGC bandwidth (narrow)		E3
ALSEP received AGC (RCVR pre-lim lev)	A3	
Rcvr No. 1 loop bandwidth (narrow)		E4
ALSEP transmitter AGC (Xmit A or B)	A4	
Rcvr No. 1 TLM bandwidth (4.5 kHz)		E5
Main X angle error	A5	
USB antenna program track (on)		E6
Main Y angle error	A6	
USB auto track (on)		E7
RCVR ACQ sweep voltage	A7	
Rcvr No. 1 gain control (AGC)		E8
Xmit power	A8	

54.8.3 MAGNETIC RECORDERS

The following parameters from the system monitor will be made available through mixer No. 1 of the EMR data converter/multiplexer to the telemetry area for recording on magnetic tape.

Signal	IRIG Channel Number
Rcvr No. 1 SPE	2
Rcvr No. 1 AGC	3
Rcvr No. 3 SPE	4
Rcvr No. 3 AGC	5

Signal	IRIG Channel Number
ALSEP rcvr AGC (Rcvr prelimit)	6
ALSEP TX power (transmitter AGC)	7
Open	8
SDTC-1KC	9

54.8.4 ALSEP RCVR AND TX TELEMETERED AGC CALIBRATION POINTS

These will be supplied.

54.9 RF ACQUISITION PROCEDURES

RF acquisition procedures will be according to Maintenance Operations Memorandum (MOM) No. 1, USB Acquisition and Handover Procedures.

SECTION 55. REMOTE SITE DATA PROCESSING

55.1 REMOTE SITE DATA PROCESSING NETWORK

55.1.1 Two identical Univac 642B computers (remote site data processors) are located at each of the MSFN land-based USB stations, and at the Network Test and Training Facility (NTTF) at GSFC. Either computer system can be designated for ALSEP support.

55.1.2 A listing of MSFN stations with RSDP capability is given in Section 55 of the NOD.

55.1.3 Applicable station identification numbers and source codes are given in table 55-1.

55.2 EQUIPMENT DESCRIPTION

55.2.1 642B COMPUTER

The Univac modified 642B computer and its peripheral equipment are described in Section 55.2.1 of the NOD.

55.2.2 1218 COMPUTER

The Univac 1218 computer is described in Section 55.2.2 of the NOD.

55.3 ALSEP COMPUTER CHANNEL ASSIGNMENTS

55.3.1 642B COMPUTER

Channel assignments for the 642B computers are as follows:

Channel	Assignment
*EMU Input 0	PCM
EMU Output 0	Not used
EMU Input 1	PCM
EMU Output 1	Not used
EMU Input 2	PCM
EMU Output 2	Not used
EMU Input 3	PCM
EMU Output 3	Not used
Input 0	Not used
Output 0	Not used
Input 1	Not used
Output 1	Not used
Input 2	Not used
Output 2	Not used

*One PCM is required for each downlinked ALSEP telemetry stream.

Channel	Assignment
Input 3	Not used
Output 3	1259 Teletype
Input 4	1232 Console
Output 4	1232 Console
Input 5	Not used
Output 5	CMD status
**Input 6	MTU
Output 6	MTU
Input 7	CAM/ISA
Output 7	High-speed printer
Input 10	Not used
Output 10	Not used
**Input 11	MTU
Output 11	MTU
Input 12	DTU 2
Output 12	DTU 2
Input 13	GMT real time
Output 13	Not used
Input 14	GMT tape playback
Output 14	Not used
Input 15	Not used
Output 15	Not used
Input 16	Updata buffer
Output 16	Updata buffer
Input 17	Not used
Output 17	Not used

*One PCM is required for each downlinked ALSEP telemetry stream.

**Either channel 6 or 11 tape units may be used for ALSEP.

55.3.2 1218 COMPUTER

ALSEP channel assignments for the 1218 computer are identical to those given in Section 55.2.2.2 of the NOD.

55.4 COMMAND

55.4.1 COMMAND DATA TRANSMISSION

55.4.1.1 General. The ALSEP command system provides a means of transmitting data and other information necessary for command purposes from MCC to the ALSEP.

Table 55–1. Station Identification Bits

Station Acronym	Station ID (Dec)	TLM Overhead Word Bits 25-32 Source Codes (Oct) Line A	TLM HS Word 7 Bit 10 and Word 8 bits 1-4 CAP ID (Oct) / ALCS to Station ID (Oct)
MIL	71	100	01
GBM	41	105	02
ANG	91	111	03
BDA	02	114	04
ACN	75	117	05
CYI	04	121	06
MAD	23	122	07
CRO	08	244	10
HSK	25	247	11
GWM	24	253	12
HAW	12	255	13
GDS	28	260	14
GYM	14	256	15
TEX	16	263	16
MLA	72	172	22
ETC	77	130	24
GLN	78	166	25
		TLM Overhead Word Bits 33-40 MCC ALSEP Destination Code = 160	

Note

1. The station ID is typed in at the 1232 keyboard and used by MCC to determine the originator.
2. ALCS-to-station ID: Bits 25-29 of the command execute format.
3. Source code: MCC/GSFC (494) uses this ID to identify station transmitting data.
4. CAP ID: ALCS uses bits 20-24 of CMD return subblock to identify station transmitting CAP.
5. Data processors located at GLN (GSFC, Glendale building) are used for development and checkout of computer programs.

55.4.1.2 MSC to Remoted Station Transfer

a. The flow of ALSEP command data through the MSFN is illustrated in figure 55-1. It should be noted that data passing from the MSC ALSEP computer (ALCS) to GSFC can follow one of two routes. The first route involves transmission through CCATS, while the second is a direct route through the ALSEP Interface Control Unit (AICU). During the Apollo operational phases of the flight (Phase I), all outgoing data will have the CCATS source code (mission 1 = 265, mission 2 = 212). However, once the package has been placed on the moon and the spacecraft has returned to earth, CCATS will no longer support the ALSEP and all outgoing data will have the ALSEP source code (160). Regardless of the status of CCATS, all incoming data will have the ALSEP destination code (160).

b. Commands will be initiated from the appropriate flight control console by thumbwheel selection of three numerical digits and the subsequent depression of an execute PBI. The three digits selected for a Command Execute Request (CER) will correspond to the command octal number. The three digits selected for a Computer Execute Function (CEF) will correspond to the octal number of the function desired. The CER or CEF will be formatted by the ALCS and transmitted from MCC to GSFC, via the 50.0-kbps interface. GSFC will reformat the data and output it to the appropriate MSFN station, via 2.4-kbps interface. The MSFN station will process and format a Command Analysis Pattern (CAP) message response for transmission to MCC.

c. If the CER is a valid request for an RTC uplink, the MSFN RSDP will reformat it and uplink the command to the selected ALSEP. The uplink data is received by the ALSEP data subsystem antenna, routed through a diplexer, demodulated by the command receiver, decoded by the command decoder, and applied to the experiment and support subsystems as discrete commands. The discrete commands control the operation of the experiment and support subsystem and initiate command verification functions. The command verification is sent from the decoder to the data processor, converted to the downlink telemetry format, and routed through the transmitter. The transmitter generates the downlink transmission carrier and modulates the carrier with the signal from the data processor. The transmitter signal is selected by the diplexer switch and routed to the antenna for downlink transmission. The RSDP receives the downlink, extracts the command verification word from the data stream, and, based upon the status of the bits in the verification word, generates the appropriate CAP response for transmission to MCC.

55.4.1.3 Sixty-bit Execute Formats

a. The MSC ALCS generates both CERs and CEFs for transmission to the network stations. Each of these types is a single subblock message containing 60 binary bits: 30 bits contain data, 27 provide polynomial error protection, and three are fillers. Only one execute message is transferred from the ALCS to an MSFN station as a result of a flight controller command execution.

b. The CER results in the uplink of RTCs from the MSFN station to the ALSEP. The CEF causes the output of either a USB station status CAP or a teletype RTC inventory summary.

c. The CER and CEF formats are shown in figure 55-2.

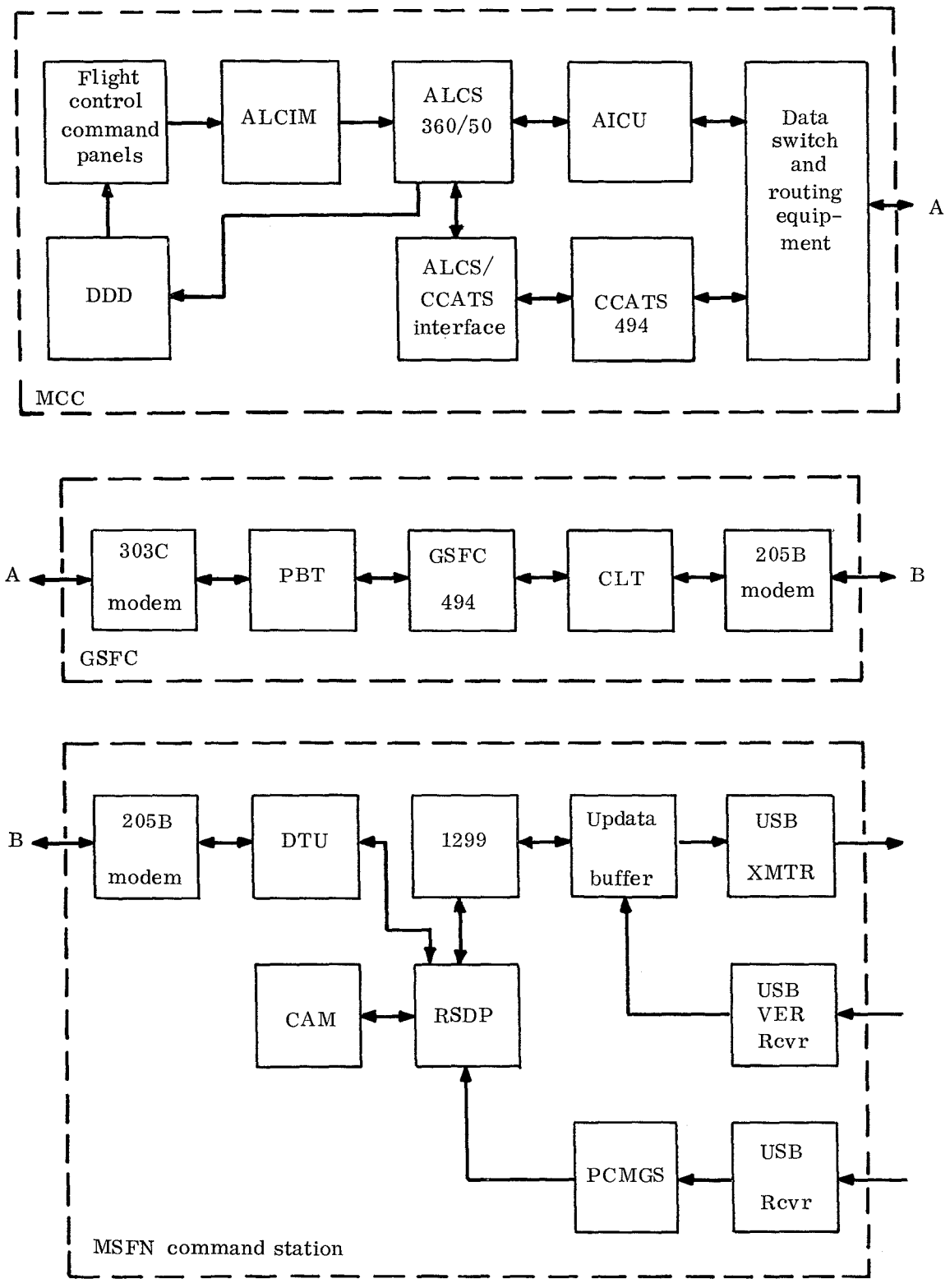


Figure 55-1. Command Data Flow

1 3	4 13	14 20	21 24	25 29	30	31 57	58 60
111 C E R	Three-digit Code Specifies the 3-digit code for the RTC that is desired for uplink. Code is binary representation of an octal number entered.	Decoder Address Specifies one of a possible eight ALSEP decoder addresses. This is the actual address used in the uplink.	Index Accountability number of execute from MCC	Station ID Specifies the station to which the execute is being sent (Refer to table 55-1)	M A P O v r d *	Poly Error Code	Fill
110 C E F	Three-digit Code Specifies the 3-digit code for the ground function to be performed. This is a binary representation of an octal code entered. 776 - USB station/ carrier status request 777 - RTC inventory summary request	Spares This is an all-zero field.	Index Accountability number of execute from MCC	Station ID Specifies the station to which the execute is being sent. (Refer to table 55-1)	S p a r e	Poly Error Code	Fill

* Set = OVERRIDE ON
Reset = OVERRIDE OFF

Figure 55–2. GSFC 60–bit Execute Formats

55.4.1.4 Forty-bit Command Analysis Pattern Formats

a. The Command Analysis Pattern (CAP) message is 40 bits in length. Twenty-six bits contain data and 14 provide polynomial error protection. The MSFN station transmits each CAP three times.

b. The types of CAP illustrated in figure 55-3 are as follows:

(1) Station Validation/RSDP Invalidation. This CAP is used to indicate the status of the execute request (CER or CEF) from MCC. If the execute passes all RSDP checks, an RSDP VAL CAP is generated and sent to MCC. If the execute fails certain RSDP checks and will not be acted upon further by the RSDP, an RSDP INVAL CAP is generated and sent to MCC.

(2) Ground Reject. This CAP is generated when either the RSDP has uplinked a command and the RF loop data indicates that an error has occurred and no Message Acceptance Pulse (MAP) has been received from the ALSEP, or an error has occurred within the RSDP command processing routines.

(3) Spacecraft Verification. This CAP is generated when a command has been uplinked and a valid MAP pattern has been received from the ALSEP during the MAP waiting period.

(4) Spacecraft Reject. This CAP is generated when a command has been uplinked, the MAP waiting period has elapsed, and no MAP has been received from the ALSEP.

(5) Station/Carrier Status. Upon request, MCC generates this CAP to provide information on the operational condition of the station RSDP (such as FC or M&O Mode, Mode I or Mode II), the status of the USB transmitters, and the enable/disabled condition of the critical RTCs.

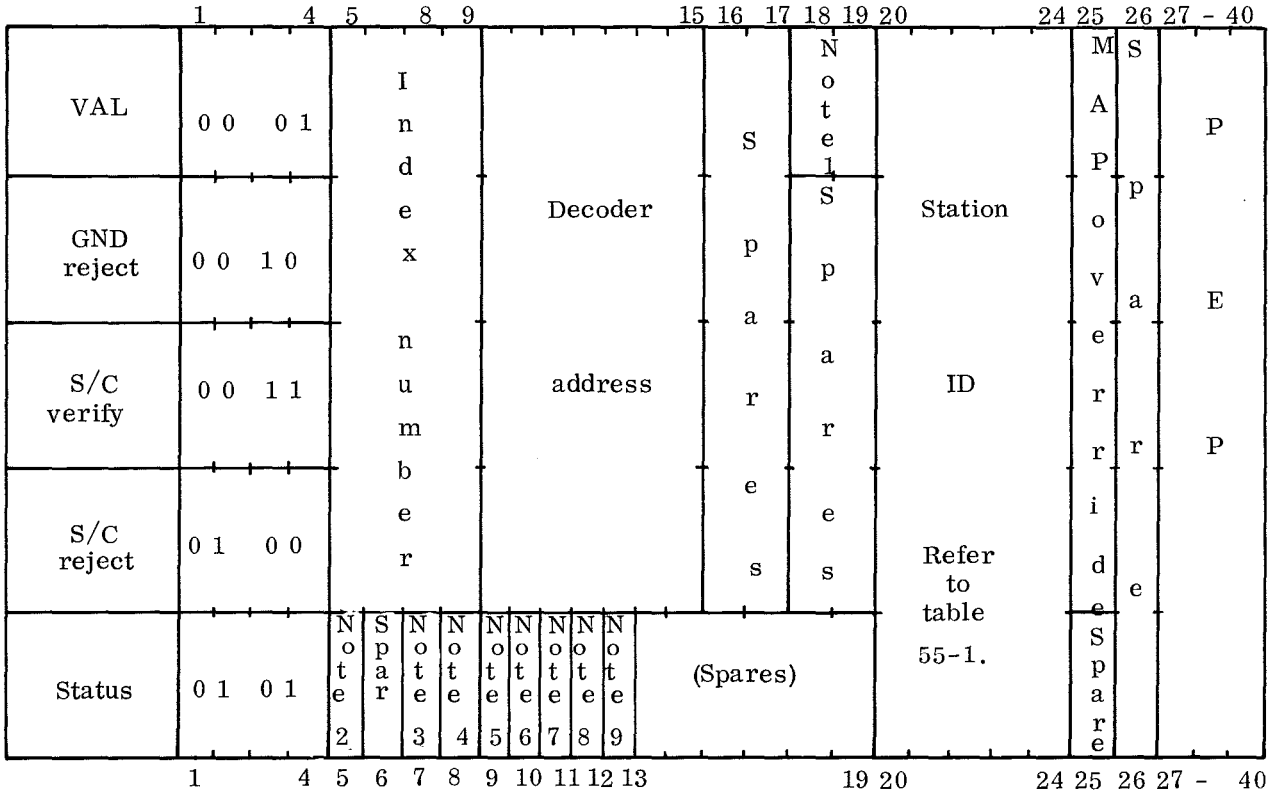
55.4.2 COMMAND UPLINKING

55.4.2.1 General. Normal RTCs and critical RTCs are stored in the command program when it is first loaded. It is necessary to enable critical commands by CAM request in Mode I and M&O Mode before they are suitable for uplink. Normal RTCs are enabled upon program initialization. Both types of RTCs consist of 75 decimal bits, uplinked as three 25-bit words.

55.4.2.2 ALSEP Command Uplink Format. The format for the ALSEP command uplink is illustrated in figure 55-4 and explained in the following subparagraphs:

a. Decoder Address

(1) The decoder address allows the command to be accepted only by the vehicle and decoder specified by the decoder code. The decoder address may be modified by the manual I/O routine designated VAD (see Section 55.6).



Note

1. Execute status:
   - 0 1 Execute passes all checks (RSDP VAL)
   - 1 0 Execute passes gross check but fails other checks (RSDP INVAL)
   - 1 1 Execute fails gross checks and is rejected (RSDP REJECT)
2. 0 = M&O Mode; 1 = FC Mode
3. 0 = Mode I; 1 = Mode II
4. 0 = USB No. 2 Off; 1 = USB No. 2 On
5. 0 = USB No. 1 Off; 1 = USB No. 1 On
6. 0 = Critical RTC group 1 disabled
   1 = Critical RTC group 1 enabled
7. 0 = Critical RTC group 2 disabled
   1 = Critical RTC group 2 enabled
8. 0 = Critical RTC group 3 disabled
   1 = Critical RTC group 3 enabled
9. 0 = Critical RTC group 4 disabled
   1 = Critical RTC group 4 enabled

Figure 55–3. Forty–bit Command Analysis Pattern (CAP) Formats

(2) The following are the stored decoder addresses:

ALSEP Vehicle	Decoder	Address (Octal)
1	A	130
1	B	030
2	A	116
2	B	016
3	A	151
3	B	051
4	A	025
4	B	065

b. Sub-bit Codes. The ALSEP command program does not utilize sub-bit encoding.

c. Spacing Between Commands. Command spacing at 1000 milliseconds is stored in the command program upon initialization. There are no provisions to change the command spacing.

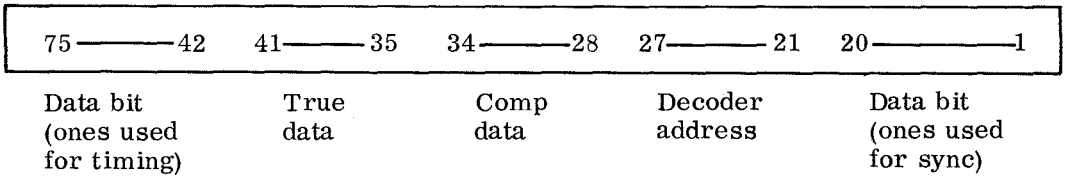


Figure 55-4. ALSEP Command Uplink Format

d. MAP Waiting Period. The MAP waiting period is variable from 1000 milliseconds to 5000 milliseconds in 1-millisecond intervals. The value of 5000 milliseconds, which is stored in the command program upon initialization, may be modified by the manual I/O routine designated MWP (see paragraph 55.6).

e. Automatic Retransmission. The ALSEP command program does not automatically retransmit a command.

55.4.2.3 Command Uplink Processing. USB system No. 1 (bit 27 of the UDB control register) will be selected exclusively for ALSEP commanding.

55.4.2.4 MAP Processing

a. Word 46 for ALSEP 1 and ALSEP 2 or word 5 for ALSEP 3 and ALSEP 4 normal and contingency downlink will be interrogated for MAP processing. The MAP word is broken down as follows:

1	2	3	4	5	6	7	8	9	10
X	X	T	T	T	T	T	T	T	C
								LSB	

where X = Not used for MAP processing

T = True command data bits received by the ALSEP decoder

C = Check bit, set upon a good comparison of the ALSEP received true data bits with the received complement data bits; reset denotes a bad comparison.

b. Spacecraft verification is accomplished only when the true data bits in the MAP word compare identically with the stored true data bits of the uplinked command and the check bit is set.

c. Spacecraft rejection results if the true data bits do not compare or the check bit is reset.

55.4.2.5 Ground Reject Processing. A ground reject condition will exist under any one of the following conditions:

a. The required path cannot be established.

b. A checksum error occurred during data retrieval.

c. A data bit error was detected during formating.

d. MAP verification was not established and an RF loop error existed.

55.4.2.6 Loop Test. Refer to Section 1.2.45 of the MSFN UCATS reference manual for those portions applicable to the USB system.

55.4.2.7 RTC Inventory Summary Messages. The RTC Inventory Summary Messages contain a list of all defined RTCs. RTCs which have been disabled will contain dummy data (000_8). The message can be requested on the HSP or TTY. The TTY summary message can be transmitted to MCC if required.

55.4.3 COMPUTER ADDRESS MATRIX (CAM) FUNCTIONS

55.4.3.1 CAM Description

a. The PBIs on the ALSEP CAM keyboard (see figure 55-5) are as follows:

(1) ALSEP 1, ALSEP 2, ALSEP 3, ALSEP 4. By pressing one of these latch interlocks or latching PBIs, the vehicle associated with the desired command function is selected. The latched vehicle PBI illuminates white.

(2) CLEAR. This momentary-action PBI clears the CAM adapter and encoder register of all accumulated bits. The encoder register must be cleared after each request has been initiated, unless the same message is to be reinitiated. This PBI can also be used to clear the encoder register of invalid bit codes which have been entered from the numerical keyboard. It illuminates white when pressed.

(3) INITIATE. When this momentary-action PBI is pressed in proper sequence with a valid CAM input, the computer executes the request. It illuminates white when pressed.

(4) DCDR A or DCDR B. The decoder to be accessed is selected by pressing one of these interlocks or latching PBIs. The latched PBI illuminates white and the unlatched PBIs extinguish.

(5) RTC CLEAR, REVIEW, ENABLE, ALSEP 3, and ALSEP 4. These latching PBIs are not interlocked; any one, or combination thereof, can be latched simultaneously. These PBIs are used as part of the CAM input code and determine the type of function to be performed by the computer. They illuminate white while latched.

(6) ERROR. This indicator illuminates red whenever more or less than three digits have been entered into the encoder register by the numerical keyboard and the INITIATE PBI has been pressed. Pressing the CLEAR PBI clears the encoder register of accumulated bits and extinguishes the ERROR indicator.

(7) UPLINK. This momentary-action PBI is pressed in conjunction with the INITIATE PBI to uplink commands. It illuminates white while pressed.

(8) NUMERICAL KEYBOARD. The desired function is selected by pressing the appropriate numbered PBIs in proper sequence to enter a three-digit decimal code. These momentary-action PBIs illuminate white when pressed.

Note

Upon ALSEP program initialization, the CAM normally designated as the CMD CAM will be utilized as the ALSEP CAM. The CMD CAM functions can be transferred to the TLM CAM via the CAM I/O routine. The above description will apply. All RSDP stations will relabel the CMD CAM as shown in figure 55-5.

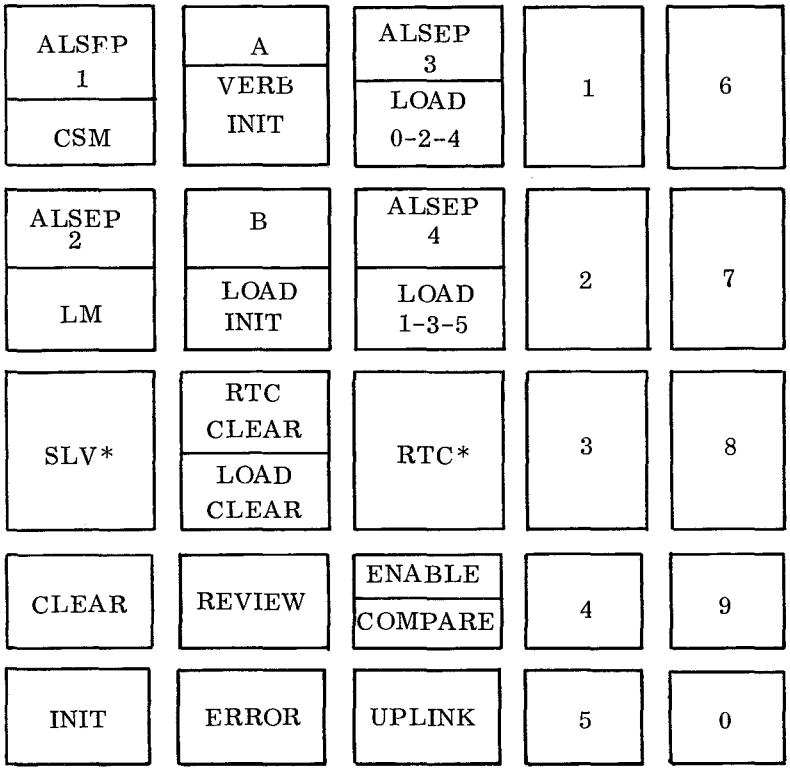


Figure 55-5. ALSEP CAM

a. A CAM truth table of desired functions and required conditions is given in table 55-2.

b. CAM codes and associated functions are given in table 55-3.

*PBIs not required for ALSEP use.

Table 55–2. CAM Truth Table

Conditions Required / Function Requested	MI M/O	MI F/C	MII F/C	CAM Uplink in Progress	MCC Uplink in Progress	Critical RTC Enabled
RTC Uplink	–	+	–	–	–	+
RTC Review	0	0	0	–	–	0
RTC Enable	+	–	–	–	–	*
RTC Disable	+	–	–	–	–	+
F/C Mode	+	0	0	–	–	0
M/O Mode	0	+	–	–	–	0
Mode I	0	0	+	–	–	0
Mode II	–	+	0	–	–	0
TTY Inventory	0	0	0	–	–	0
HSP Inventory	0	0	0	–	–	0
TTY Inv Term	0	0	0	–	–	0
HSP Inv Term	0	0	0	–	–	0
Map Ovrd On	–	+	–	–	–	0
Map Ovrd Off	–	+	–	–	–	0
Station Status	–	0	0	–	–	0
ALSEP param list	0	0	0	–	–	0
CMDH EOF	0	0	0	–	–	0
Cancel CAM	0	0	0	0	0	0

Legend

(+) Required (-) Illegal (0) Of no consequence

(*) Opposite condition required

55.4.3.2 CAM Word Structure. The structure of the ALSEP CAM word, as input to the computer, is as follows:

	Bit	Meaning
	29	Not used
	28	USB status input
	27	TLM CAM
	26	CMD CAM
	25	Not used
	24	Not used
Latching	23	RTC clear
	22	Review
	21	ALSEP 3
	20	ALSEP 4
	19	Not used
	18	Enable
Momentary	17	Uplink
Latch Interlock	16	ALSEP 1
	15	ALSEP 2
	14	Not used
Latch Interlock	13	DCDR A
	12	DCDR B
Momentary	11 thru 8	lst BCD digit
	7 thru 4	2nd BCD digit
	3 thru 0	3rd BCD digit

Table 55–3. ALSEP CAM Functions

CAM Code	Function
900	Disables all critical RTCs
911	Enables group 1 RTCs
922	Enables group 2 RTCs
933	Enables group 3 RTCs
944	Enables group 4 RTCs
971	Aborts TTY inventories
972	Aborts HSP inventories
977	Selects FC mode
978	Selects M/O mode
979	Selects Mode I
980	Selects Mode II
981	Selects TTY RTC inventory
982	Selects HSP RTC inventory
983	Selects MAP override on
984	Selects MAP override off
988	Selects USB loop test
990	Selects ALSEP parameter listing
996	Write end-of-file on CMD history tape
999	Cancels CAM

55.4.3.3 ALSEP CAM Operation

a. Selection of Functions or Mode

(1) Press CLEAR.

(2) Select appropriate CAM numbers.

(3) Press INIT.

(4) The high-speed printer will printout the request.

(5) Verify that this is the function you wish to perform.

(6) Press INIT.

(7) The ALSEP program will select the function and the high-speed printer will print out the function.

b. Uplinking RTCs

(1) Press CLEAR.

(2) Press appropriate vehicle.

(3) Press appropriate decoder.

(4) Press appropriate RTC number.

(5) Press INIT.

(6) The high-speed printer will print out (for example) the following:

RTC 005 2A UPL REQ

(7) Press UPLINK.

(8) Press INIT.

(9) The high-speed printer will print out (for example) the following:

CAM UPLINK 005 1A ASE HBR OFF

RF LOOP DATA 5416405

MAP VERIFY 005 1

or

GND REJECT 0*5 0 5

or

S/C REJECT 005 0

c. Reviewing RTCs

(1) Press CLEAR.

(2) Press RTC REVIEW.

(3) Press appropriate RTC numbers.

(4) Press INIT.

(5) The high-speed printer will print out (for example) the following:

RTC 005 REV REQ

(6) Press INIT.

(7) The high-speed printer will print out (for example) the following:

RTC 005/005 ASE HBR OFF

d. RTC Disabling

(1) Press CLEAR.

(2) Press RTC CLEAR.

(3) Press appropriate RTC numbers.

(4) Press INIT.

(5) The high-speed printer will print out (for example) the following:

RTC 005 DISABLE REQ

(6) Press INIT.

(7) The high-speed printer will print out (for example) the following:

RTC DSBL 005/000

e. RTC Enabling

(1) Press CLEAR.

(2) Press RTC ENABLE.

(3) Press appropriate RTC numbers.

(4) Press INIT.

(5) The high-speed printer will print out (for example) the following:

RTC 005 ENABLE REQ

(6) Press INIT.

(7) The high-speed printer will print out (for example) the following:

RTC ENBL 005/005

f. Enabling Critical RTCs

(1) Press CLEAR.

(2) Press RTC ENABLE.

(3) Press appropriate RTC group numbers.

(4) Press INIT.

(5) The high-speed printer will print out (for example) the following:

RTC GROUP 3 ENABLE REQ

(6) Press INIT.

(7) The high-speed printer will print out (for example) the following:

RTC ENBL CRIT GRP 3 RTC/DATA

SITE SURVEY XYZ 133/133

g. Disabling all Critical RTCs

(1) Press CLEAR.

(2) Press RTC CLEAR.

(3) Press 900.

(4) Press INIT.

(5) The high-speed printer will print out (for example) the following:

CRIT RTC DSBL REQ

(6) Press INIT.

(7) The high-speed printer will print out (for example) the following:

RTC DSBL CRIT ALL RTC/DATA

TIMER OUT INHIB 033/000

↓ ↓ ↓ ↓

GRENADE 4 FIRE 170/000

h. Requesting TTY Inventory

(1) Press CLEAR.

(2) Press 981.

(3) Press INIT.

(4) The high-speed printer will print out the following:

CAM RTC INV TTY REQ

(5) Press INIT.

(6) The high-speed printer will print out the following:

INV SUM IN PROGRESS

(7) The TTY printer will print out (for example) the following:

GDS 001A

SS HOPS

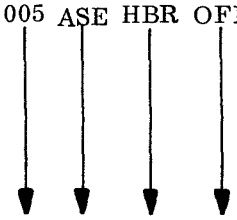
DE GGDS

15/1400Z

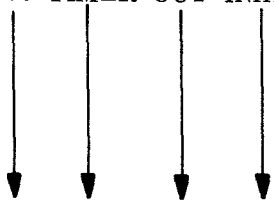
RTC INV SUM

003 ASE HBR ON

005 ASE HBR OFF



000 TIMER OUT INHIB



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15/1401Z APR GGDS

Note

000 represents the octal of dummy data stored in core for RTCs not in active storage area.

(8) The high-speed printer will print out the following:

INV SUM COMPLETED

i. Requesting HSP Inventory

(1) Press CLEAR.

(2) Press 982.

(3) Press INIT.

(4) The high-speed printer will print out the following:

RTC INV HSP REQ

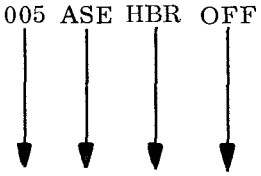
(5) Press INIT.

(6) The high-speed printer will print out (for example) the following:

RTC INVENTORY

003 ASE HBR ON

005 ASE HBR OFF



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55.4.4 REAL-TIME COMMANDS

The following is a list of the ALSEP RTCs:

CAM No.	Review and True Uplink Data	Applicable Vehicle	Review, Uplink, Inventory, and History Printouts
003		4	ASE HBR ON
005		4	ASE HBR OFF
006		All	NORM BIT RT SEL
007		All	LOW BIT RT SEL
011		All	NORM BIT RT RST
012		All	XMTR A SEL
013		All	XMTR ON
014		All	XMTR OFF
015		All	XMTR B SEL
017		All	DISSIP R1 ON
021		All	DISSIP R1 OFF
022		All	DISSIP R2 ON
023		All	DISSIP R2 OFF
024		All	DSS HTR 3 ON
025		All	DSS HTR 3 OFF
027		All	DUST CELLS ON
031		All	DUST CELLS OFF
032		All	TIMER OUT ACCPT

CAM No.	Review and True Uplink Data	Applicable Vehicle	Review, Uplink, Inventory, and History Printouts
033	(critical - group 2)	All	TIMER OUT INHIB
034		All	DSS/PROC X SEL
035		All	DSS/PROC Y SEL
036		All	EXP 1 OPER SEL
037		All	EXP 1 STBY SEL
041		All	EXP 1 STBY OFF
042		All	EXP 2 OPER SEL
043		All	EXP 2 STBY SEL
044		All	EXP 2 STBY OFF
045		All	EXP 3 OPER SEL
046		All	EXP 3 STBY SEL
050		All	EXP 3 STBY OFF
052		All	EXP 4 OPER SEL
053		All	EXP 4 STBY SEL
054		All	EXP 4 STBY OFF
055		All	DSS HTR 1 SEL
056		All	DSS HTR 2 SEL
057		All	DSS HTR 2 OFF
060	(critical - group 2)	All	PCU 1 SEL
062	(critical - group 2)	All	PCU 2 SEL
063		All	PSE/XY GAIN CH
064		All	PSE/Z GAIN CH
065		All	PSE/SP CAL CH
066		All	PSE/LP CAL CH
067		All	PSE/SP GAIN CH
070		All	LVL MTRX ON/OFF
071		All	LVL MTRY ON/OFF
072	(critical - group 1)	All	LVL MTRZ ON/OFF
073	(critical - group 1)	All	UNCAGE ARM/FIRE
074		All	LVL DIR POS/NEG
075		All	LVL SPEED HI/LO
076		All	PSE T CTL CH
101		All	PSE FILT IN/OUT

CAM No.	Review and True Uplink Data	Applicable Vehicle	Review, Uplink, Inventory, and History Printouts
102		All	LVL SNSR IN/OUT
103		All	PSE LVL MDE A/M
104		1 and 4	SIDE LOAD 1
105		1 and 4	SIDE LOAD 2
106		1 and 4	SIDE LOAD 3
107		1 and 4	SIDE LOAD 4
110		1 and 4	SIDE EXECUTE
111		3 and 4	CPE OPR HTR ON
112		3 and 4	CPE OPR HTR OFF
113	(critical - group 1)	3 and 4	CPE CVR GO
114		3 and 4	CPE DEF SEQ ON
115		3 and 4	CPE DEF STEP
117		3 and 4	CPE DEF SEQ OFF
120		3 and 4	CPE CHAN/HI SEL
121		3 and 4	CPE CHAN/LO SEL
122	(critical - group 1)	1	SWS CVR GO
123		1	LSM RANGE STEPS
124		1	LSM FLD O/S CH
125		1	LSM O/S ADD CH
127		1	FLIP/CAL INHIB
131		1	FLIP/CAL GO
132		1	LSM FILT IN/OUT
133	(critical - group 3)	1	SITE SURVEY XYZ
134		1	LSM T CTL XY0
135		3	HFE MODE/G SEL
136		3	HFE MODE/LK SEL
140		3	HFE MODE/HK SEL
141		3	HFE SEQ/FUL SEL
142		3	HFE SEQ/P1 SEL
143		3	HFE SEQ/P2 SEL
144		3	HFE LOAD 1
145		3	HFE LOAD 2
146		3	HFE LOAD 3
150		N/A	SPARE 1

CAM No.	Review and True Uplink Data	Applicable Vehicle	Review, Uplink, Inventory, and History Printouts
152		3	HFE HTR STEPS
153		N/A	SPARE 2
154		N/A	SPARE 3
155		N/A	SPARE 4
156		4	GEO CAL GO
160		N/A	SPARE 5
162	(critical - group 4)	4	ASE SEQ/S FIRE
163	(critical - group 4)	4	GRENADE 1 FIRE
164	(critical - group 4)	4	GRENADE 2 FIRE
165	(critical - group 4)	4	GRENADE 3 FIRE
166	(critical - group 4)	4	GRENADE 4 FIRE
170		4	GRENADE ARM
171		N/A	SPARE 6
172		N/A	SPARE 7
174		N/A	SPARE 8

55.4.5 OUTPUT MESSAGES

55.4.5.1 High-Speed Printer Messages

a. The following is a list of the high-speed printer messages:

Item Number	HSP Printout	Explanation
1	CANCEL CAM	The previous CAM request has been cancelled (assuming this is a B sequence request). This will not terminate a CAM function which is already in progress.
2	MODE 1 REQ	A request has been inserted to initiate the selection of mode operation (note 1)
3	CMD MODE 1	Mode 1 operation has been selected.
4	MODE 2 REQ	A request has been inserted to initiate the selection of Mode 2 operation (note 1)

Item Number	HSP Printout	Explanation
5	CMD MODE 2	Mode 2 operation has been selected.
6	F/C MODE REQ	A request has been inserted to initiate the selection of flight controller mode of operation (note 1).
7	CMD F/C MODE	Flight controller mode of operation has been selected.
8	M/O MODE REQ	A request has been inserted to initiate the selection of maintenance and operations mode of operation (note 1).
9	CMD M/O MODE	The maintenance and operations mode of operation has been selected.
10	MAP OVRD ON REQ	A request has been inserted to initiate the selection of MAP override mode for CAM uplink purposes (note 1).
11	MAP OVERRIDE ON	The MAP override mode has been selected for future CAM uplink processing.
12	MAP OVRD OFF REQ	A request has been inserted to initiate the deselection of MAP override mode (note 1).
13	MAP OVERRIDE OFF	MAP override mode has been deselected for future CAM uplink processing.
14	CMDH EOF REQ	A request has been inserted to initiate the recording of an end-of-pass identifier (note 2).
15	CMDH EOF	The end-of-pass identifier has been recorded on the command history tape. The tape is being repositioned at this time.
16	RTC XXX ENABLE REQ	A request to enable RTC number XXX has been inserted (note 2).
17	RTC ENBL XXX/DDD	RTC number XXX has been enabled. DDD is the uplink data (note 3).
18	RTC XXX DISABLE REQ	A request to disable RTC number XXX has been inserted (note 2).

Item Number	HSP Printout	Explanation
19	RTC DSBL XXX/DDD	RTC number XXX has been disabled. DDD is the uplink data, now zeroes (note 3)
20	RTC XXX REV REQ	A request to review RTC number XXX has been inserted.
21	RTC XXX/DDD Z-Z	This is the review printout. XXX is the RTC number. DDD is the uplink data. Z-Z is the English of the RTC.
22	RTC GRP X ENBL REQ	A request to enable critical RTC group X has been inserted (note 2).
23	RTC ENBL CRIT GRP X RTC/DATA Z-Z XXX/DDD	Critical RTC group X has been enabled. Z-Z is the English of the RTC. XXX is the RTC number. DDD is the uplink data. (There is one of these lines for each RTC that has been enabled.) Refer to note 3.
24	CRIT RTC DSBL REQ	A request to disable all critical RTCs has been inserted (note 2).
25	RTC DSBL CRIT ALL RTC/DATA Z-Z XXX/DDD	All of the critical RTCs have been disabled. Z-Z is the English of each RTC. XXX, the RTC number and the DDD the uplink data, zeroes. Also note that the RTCs will be reset to the disable condition even though they may have already been disabled (note 3).
26	RTC XXX YZ UPL REQ	A request RTC XXX has been inserted. Y is the vehicle address 1-4, while Z is the decoder address, A or B (note 2).
27	SSS UPLINK XXX YZ 0 Z-Z	An uplink of RTC number XXX is in progress where: a. SSS is the source of the uplink, CAM or MCC. b. Y is the vehicle, 1-4. c. Z is the decoder, A or B. d. 0 is the status of MAP override, blank for override off, 0 for on. Note that the override status is included in the HSD uplink request. e. Z-Z is the English of the RTC.

Item Number	HSP Printout	Explanation
28	RF LOOP DATA XXXXXXX	An uplink of an RTC is in progress where XXXXXXX is the octal of the data uplinked, the complement of same, and the vehicle/decoder (right to left, seven bits in each field).
29	MAP VERIFY XXX C	An uplink has been verified by MAPs from an ALSEP vehicle or the command has been uplinked in the MAP override mode. XXX is the TLM data (bits 3-9 of MAP word). C is the check bit.
30	S/C REJECT XXX C	The system has transmitted a command to an ALSEP vehicle and has not received MAP verification from that vehicle. XXX is the TLM data (bits 3-9 of MAP word). C is the check bit.
31	GND REJECT XXX C Y	A ground rejection condition exists on the current uplink and all uplink activity has been terminated. XXX is the TLM data (bits 3-9 of MAP word). C is the check bit. Y represents the condition which caused the ground reject as follows: a. Y is 1 if the required path cannot be established. b. Y is 2 if a checksum error occurs during data retrieval. c. Y is 4 if a data bit error is detected during formatting. d. Y is 5 if a RF loop check error exists; MAP verification is required and has not been received from the vehicle.
32	UDB MOD/DEMODS XX	Three successive uplinks with ground reject causes a switch in the UDB MOD/DEMOD path. The XX reflect computer bits 29 and 30 (respectively) in the computer output buffer (bits 30 and 29 on the UDB control panel).
33	XXX SITE STATUS REQ	A request has been inserted to initiate a status test on the USB transmission system. XXX is the initiating source (note 2).

Item Number	HSP Printout	Explanation
34	SITE STATUS TEST XXX	A status test is in progress on the USB transmission system. XXX is a good (OK) or BAD result.
35	STATUS IN PROG XXX	A CAM site status request has been received while a status test is in progress (note 4).
36	RTC INV HSP REQ	A request has been inserted to initiate an RTC inventory printout on the HSP (note 2).
37	XXX Z-Z	This is the HSP inventory. The XXX is the RTC number. All RTCs that are disabled will contain 000 in place of the RTC number. Z-Z is the English of the RTC.
38	HSP INV ABORT REQ	A request has been inserted to abort the HSP inventory currently in progress (note 2).
39	HSP INV ABORTED	The HSP inventory has been aborted. The request for this message is placed on the HSP stack. Normally items 38 and 39 will follow immediately after the HSP inventory when requested.
40	XXX RTC INV TTY REQ	A request has been inserted to initiate a RTC inventory summary on the TTY. XXX is the initiating source (note 2).
41	INV SUM IN PROGRESS	An RTC inventory summary is in progress on the TTY.
42	INV SUM COMPLETED	An RTC inventory summary has been completed on the TTY.
43	INV SUM IN PROG XXX	An inventory summary request has been received while one is in progress (note 4).
44	TTY INV ABORT REQ	A request has been inserted to abort the TTY inventory summary in progress (note 2).
45	TTY INV ABORTED	The TTY inventory has been aborted.

Item Number	HSP Printout	Explanation
46	TLM CAM ENABLE	The ALSEP program has disabled input from the CMD CAM and enabled input from the TLM CAM.
47	CMD CAM ENABLED	The ALSEP program has disabled input from the TLM CAM and enabled input from the CMD CAM.
48	GMT ENABLED	The program is using the ISA time input for data.
49	GMT DISABLED	There has been a total of 10 timing and/or data errors in the last 30 seconds and the Real Time Clock is being used to calculate the GMT.
50	ALSEP PARAM LIST REQ	A request has been inserted for the parameter list (note 2).
51	NOT IN F/C XXX	A CAM request has been received. It is legal only in F/C mode and the program is in M/O mode (note 4).
52	NOT IN M/O XXX	A CAM request has been received while the program is in F/C. It is legal only in M/O (note 4).
53	NOT IN MODE 1 XXX	A CAM request has been received while the program is in Mode 2. It is legal only in Mode 1 (note 4).
54	MODE CONFIRMED	The ALSEP program has been found to be in the requested mode.
55	RTC XXX NOT FOUND	An RTC has been selected for future uplink, review, enable, or disable and is not defined for this mission (note 4).
56	DISABLED RTC XXX	RTC XXX has been requested for uplink. However, it is in a disabled condition and cannot be uplinked.
57	ILLEGAL REQ XXX	A CAM request has been found to be undefined or illegal (note 4).
58	ILLEGAL VEHICLE XXX	A request has been inserted (on the A sequence) for an uplink. The vehicle/decoder latches are in an illegal combination (note 4).

Item Number	HSP Printout	Explanation
59	SEQUENCE A ERROR XXX	A CAM request has been found to be illegal because the uplink latch has been latched (note 4).
60	SEQUENCE B ERROR XX	A CAM request has been found to be illegal on the second (B) sequence. It is illegal because the same latches set on the A sequence were not set on the B sequence (note 4).
61	UPLINK IN PROG XXX	A CAM request has been received while an uplink is in progress(note 4).
62	SERIOUS RTC DATA ERR	While attempting to enable RTCs, a serious data error has been found. This message should never be seen. Future uplinking would be unwise until the program has been reloaded.
63	CAM ILL COND XXXXXX	Indicates possible hardware error found during processing checks. X-X is the address in the CAM sub-program where the error was detected.
64	BAD BCD XX XX XX	The program has received a CAM input with a bad BCD code. The XX pairs are the octal of each BCD number.
65	HSD PEP ERROR	A high speed data execute has failed PEP check.
66	HSD NOT IN F/C	An HSD request has been received with the program in M/O mode. It is legal only in F/C.
67	HSD NOT IN MODE 2	An HSD request had been received with the program in Mode 1. It is legal only in Mode 2.
68	HSD BAD RTC REQ XXX	The input code of a HSD execute is illegal for an RTC uplink request. XXX is the RTC number.
69	HSD DISABLED RTC XXX	An HSD uplink request is for a disabled RTC. XXX is the RTC number.
70	HSD BAD EXEC REQ X	An HSD request has been found to have a bad execute type. X is the execute type.

Item Number	HSP Printout	Explanation
71	HSD BAD CEF XXXX	An HSD request had been received with an illegal CEF code. XXXX is the CEF code of the HSD input.
72	HSD BAD SITE ID XX	The site ID of a HSD request does not match the site ID stored in the program. XX is the site ID of the HSD request.
73	HSD SAME INDEX XXX	The index number of a HSD request is the same as the previous execute. XXX is the index number of the HSD request.
74	HSD BAD DECODER XXX	The decoder address of the HSD RTC uplink execute request is illegal. XXX is the decoder of the HSD request.
75	HSD UPLINK IN PROG	An HSD uplink request, site status request, or inventory summary has been received while an uplink is in progress.
76	HSD UPLINK TOO SOON	An HSD request to uplink a RTC has been received within 1 second of a previous uplink.
77	HSD INV SUM IN PROG	An HSD inventory summary (TTY) has been received while an inventory summary is in progress.
78	HSD ILL COND XXXXXX	Indicates possible hardware error found during HSD processing checks. X-X is the address in the HSCL sub-program where the error was detected.
79	DTU NO EXT INTERRUPT	A HSCL message caused by the receipt of HSD or trash. An external interrupt (EOT) was not present at the proper time (note 5).
80	DTU IMPROPER HS DATA	High-speed data has been received. The SOM and LOC were correct. However, an EOT was not present at the proper time. This can be caused by the receipt of an Apollo HSD load (note 5).

Item Number	HSP Printout	Explanation
81	DTU BAD SOM OR LOC	High-speed data has been received. The EOT was at the proper time but either the SOM or LOC is in error (note 5).
82	DTU DID NOT TERM 1/P	A HSCL message caused by the receipt of trash from the DTU. The SOM, LOC, and EOT were not present. This message would occur if the DTU did not terminate input properly. The program tries to terminate input again (note 5).
83	HISTORY COMPLETED	All records on tape have been searched and the history request has been satisfied.
84	BAD RECORD	When four successive tape records are read with parity errors, the result is data missing on the ALSEP CMD history output listing.
85	TAPE OUT OF CONTROL	There was no response from the MTU. The tape may have been running away or may never have moved. The history request will terminate.
86	NO COMMANDS XMITTED	All records on tape have been searched and no commands were found to satisfy the history request.
87	HISTORY ABORTED	The history request was terminated while history output was in progress.

Note

1. The actual selection of this mode has not been performed at this point. The entry has only been validated as a legitimate CAM request.
2. The function has not been performed at this point. The entry has only been validated as a legitimate CAM request.
3. In addition to the checksum operation, a series of self checks are performed to ensure the integrity of the uplink data.
4. XXX is the three-digit code of the CAM request.
5. The program will print this message no faster than once every 2 minutes, no matter how many times this condition will occur.

b. An example of a high-speed printout of an ALSEP parameter listing is given in figure 55-6.

MESSAGE 50A

```
                                ALSEP PARAMETER LISTING  16:28:46   (1)
                                INITIALIZED PHASE        (2)
                                RECOVERY OPTION EXERCISED  (3)
STA MIL   (4)
GMT 69    (5)
DECODER VEHADD                  1      2      3      4       (6)
        A                       130    116    151    025
        B                       030    016    051    065
CRITICAL RTC STATUS  (7)
GROUP           RTC
  1             072   073   113   122
  2             033   060   062
  3             DSBL GRP
  4             162   163   164   165   166
MODE 2 (8)      F/C (9)      OVRD OFF (10)      MWP 05000 (11)      CAM CMD (12)
TELEMETRY FORMAT 1 SELECT 1A  2B   (13)
MAG TAPE UNITS ON CHANNEL 11       (14)
MISSION CONFIGURATION              (15)
```

Legend:

Item	Description
(1)	The GMT of the program at the time of output.
(2)	The phase at which the program was last initialized.
(3)	If the recovery option has been exercised, this will appear. Otherwise this line is blank.
(4)	Station. The program will accept HSD bearing this site ID (numeric or alpha).
(5)	The GMT year.
(6)	The vehicle/decoder addresses. The horizontal lines are for each decoder, A and B. The columns are for the four vehicles.
(7)	The status of each of the critical RTCs. If a group has been enabled, the inclusive RTCs appear on that line. Otherwise the abbreviation DSBL GRP will appear on that line.
(8)	The status of the program at that time (Mode 1 or 2).
(9)	The status of the program at that time (F/C or M/O).
(10)	The MAP override status at that time (OVRD OFF or OVRD ON).
(11)	The MAP waiting period in milliseconds.
(12)	The CAM that is presently enabled.
(13)	The telemetry format selected.
(14)	The mag tape channel being used (6 or 11).
(15)	The status of the program at that time (mission or test).

Figure 55–6. ALSEP Parameter Listing

55.4.5.2 1232 Messages. The following is a list of the 1232 messages.

Item No.	1232 Printout	Explanation
1	ILLEGAL CONDITION XXXXX	This message is typed out by procedure CUILLCOND which is called by a return from certain paths which should not be run. The numeric content (XXXXXX) indicates the address of the next instruction after the one referencing CUILLCOND.
2	UDB RF DATA ERROR XX (Updata Buffer)	This message is typed out at the conclusion of an uplink or RF loop test when the status bits (29-25) of a return buffer are good, but the data bits (24-0) are not. The numeric content (XX) is an octal representation of the status bits of the last word of the last buffer, right justified.
3	RF DATA AND STATUS ERR XX (Updata Buffer)	This message is typed out at the conclusion of an uplink or RF loop test when the status bits (29-25) and the data bits (24-0) are both deemed bad. There must be status errors in three consecutive uplink buffers in the same transmission system for the status to be counted bad on an uplink. However, only the last word of the return buffer is examined on the RF loop test and if it shows a status error the status is deemed bad. The numeric content (XX) is a right justified octal representation of those status bits which were the final basis for the status being deemed bad.
4	UDB RF STATUS ERROR XX	This message is typed out at the conclusion of an uplink of RF loop test when the status bits (29-25) are found to be bad. There must be status errors in three consecutive uplink buffers in the same transmission system for the status to be counted bad on an uplink. However, only the last word of the return buffer is examined on the RF loop test and if it shows a status error, the status is deemed bad. The numeric content (XX) is a right justified octal representation of those status bits which were the final basis for the status being deemed bad.

Item No.	1232 Printout	Explanation
5	UDB S-BAND SYSTEM FAIL XX	This message is typed out at the beginning of an uplink attempt when the computer senses that the UDB hardware is not in USB. The uplink will be ground rejected with a HSP printout of GND REJ XXX Y 1, where XXX is the TLM data and Y is the TLM check bit. XX is an octal representation of the last status bits (29-25).
6	NO LOOP TEST INPUT MONITOR	This message is typed out at the conclusion of a loop test whenever the allotted time for the input buffer to fill up expires without a monitor interrupt being received.
7	NO PATH CHNG INPUT MONITOR	This message is typed out at the conclusion of changing mod/demods or trying to get the USB transmission system up whenever the allotted time for an input buffer to fill up expires without a monitor interrupt being received.
8	UPLINK INPUT MONITOR	This message is typed out at the conclusion of an uplink attempt whenever the allotted time for an input buffer to fill up expires without a monitor interrupt being received.
9	ALSEP READY	This message is typed out when the initialization type-in entries are completed.
10	ALSEP HSP TIMEOUT	This message is typed out when an output monitor interrupt has not been received from the HSP system within a predetermined time-out period.

Item No.	1232 Printout	Explanation
11	XXXX STACK OVFL YY	The XXXX indicates three possible alpha variables: either HSP, CAP, or 1232. This message is typed out to indicate that an overflow condition was sensed in any of the three stackers. The message will be typed out after all message requests in the stacker have been processed. The YY is a count of the message request lost while the request stacker was in an overflow state.
12	DTU NO EXT INTERRUPT	This message is printed out when HSD or garble is received and an external interrupt (EOT) was not present at the correct time. This may be caused by a hardware malfunction.
13	DTU IMPROPER HS DATA	High-speed data was received with a correct SOM and LOT, but an EOT was not present at the proper time. This may be caused by the input of an Apollo load.
14	INPUT ERR WD XX	This message is typed out when an error is sensed in a 1232 keyboard input. The XX indicates the portion of the input which contains the error.
15	DTU BAD SOM OR LOC	High-speed data was received with an EOT at the proper time. However either the SOM or LOC code (or both) is incorrect.
16	DTU DID NOT TERM I/P	High-speed data was received with the SOM, LOC, and EOT not present. This message would occur if the DTU did not terminate input correctly. The program tries to terminate input again.
17	M AND O DISABLE	This message is typed out when an attempt is made to perform a 1232 keyboard input which is legal only in Maintenance and Operations (M&O) mode and the command system is in Flight Controller (F/C) mode.

Item No.	1232 Printout	Explanation
18	MT Y RD ERR	This message is typed out whenever the four iterations of a record on the command history (indicated by a 2 in the space Y) cannot be read properly.
19	MT Y WRT ERR	This message is typed out whenever at least one of the four iterations of a record on the command recovery of history (indicated by a 1 or 2 respectively in the space Y) cannot be written properly.
20	MT Y STATUS ZZZZZ	This message is typed out whenever an error is indicated in the status word that cannot be corrected by software. Y is either a 1 or 2 for command recovery or history respectively. The status words (bits 0-14) are placed in spaces ZZZZZ, unless no status word is received in a set timeout period. In this case 77777 is placed in spaces ZZZZZZ.
21	XXX STACK FULL	XXX indicates two possible alpha variables: either HSP or CAP. This message is typed out when either the high-speed printer stacker or the cap stacker has reached an overflow condition. The HSP or CAP message output request which caused the overflow to occur has been lost.
22	CHECKSUM ERROR XX	This message is typed out if a checksum error is detected in the command system. XX represents the type of error detected as follows: XX = 1 means CHINV is in error. XX = 2 means CKKKK is in error. XX = 3 means the group codes of CHINV and CKXXX disagree. XX = 4 means the command mode flags (CJSUM) are in error. XX = 5 means the MAN I/O flags are in error.

Item No.	1232 Printout	Explanation
22 (cont)	CHECKSUM ERROR XX	XX = 6 means CHINV or CKXXX has a parity error. XX = 7 means the checksum program was called incorrectly. XX = 11 means CUACT is in error. XX = 12 means one of the critical RTC indices has been cleared. XX = 13 means parity error in CHINV data of the RTC to be uplinked. XX = 14 means group code is in error for the RTC to be uplinked. XX = 15 means RTC uplink request is for a spare RTC. XX = 16 means group code for this critical RTC is illegal. XX = 17 means group code for this critical RTC uplink request is disabled. XX = 18 means data for this regular RTC uplink request differs from CKXXX . XX = 19 means data for this critical RTC uplink request differs from CKXXX .
23	STATUS OFF-LINE	The ALSEP computer is not able to output to channel 5 which controls the command status lights on the M&O console.
24	STATUS ON-LINE	The situation which prevented the ALSEP computer from being able to update the command status lights on the M&O console has been corrected. (Channel 5 output is on-line).
25	TTY TIMEOUT	TTY output buffer was not terminated within 20 seconds after outputting to the TTY.
26	TTY ON-LINE	TTY output buffer was completed following a TTY timeout.
27	GMT ENABLED	Indicates the GMT program is using the ISA input for data.
28	GMT TP ENABLED	Indicates tape playback data is being used for high-speed data.

Item No.	1232 Printout	Explanation
29	GMT DISABLED	Indicates there have been 10 timing and/or data errors in the last 30 seconds and the Real Time Clock is being used to calculate the GMT.
30	GMT TP DISABLED	Indicates there have been 10 timing and/or data errors in the last 30 seconds and the Real Time Clock is being used to calculate GMT.
31	GMT ERRORS XX YY	Indicates that there have been XX data errors and YY timing errors in the last 10 seconds. This message may appear more frequently than every 10 seconds when a disable condition is sensed.
32	GMT TP ERRORS XX YY	Indicates that there have been XX data errors and YY timing errors in the last 10 seconds. This message may appear more frequently than every 10 seconds when a disable condition is sensed.
33	INIT CMD HISTORY	This message is printed out after Real-time Off-line ALSEP Command History (ROACH) was initialized while in on-line ALSEP control.
34	TIME	This variable is typed out after off-line command history initialization, and is the first of three variables to be specified for ROACH. The operator enters the desired time interval (all times or a particular time interval) which defines the searching of the history tape.
35	VEHICLE	This variable is printed out after the operator enters the time interval for ROACH. The operator enters the specified vehicles (all vehicles or individual vehicles 1-4) which defines the searching of the history tape.
36	DESTINATION	This variable is printed out after the operator enters the vehicles for ROACH. The operator enters the destination of the output (high-speed printer, tele-type, or both).

Item No.	1232 Printout	Explanation
37	HISTORY COMPLETED	This message is typed out when all records on the history tape have been searched and commands were found to satisfy the history request.
38	BAD RECORD	Four successive tape records are read with parity errors. Data will be missing on the ALSEP history output listing.
39	TAPE OUT OF CONTROL	This message is typed out when no response is received from the MTU. The tape may have been running away or may never have moved. The history request will terminate.
40	NO COMMANDS XMITTED	All records on tape have been searched and no commands were found to satisfy the history request.
41	HISTORY ABORTED	This message is typed out when the history output is aborted. A history in progress may be aborted by entering the correct mnemonic on the 1232 I/O console.
42	IMPROPER CONDITION	This message is typed out when the improper condition bit is set in the MTU status word. A history in progress will be terminated.
43	ADDITIONAL HISTORIES REQ	After a history request has terminated, this message is typed out. The operator will type in Y for a new ROACH request, or N to terminate ROACH.

55.5 TELEMETRY

55.5.1 DOWNLINK DESCRIPTION

55.5.1.1 General. Apollo Lunar Surface Experiments Package (ALSEP) TLM data is downlinked at either a normal, contingency, or high-bit rate. The downlinked-bit rate is selectable upon earth command.

55.5.1.2 Normal Bit Rate. The normal bit-rate frame, which consists of 64 ten-bit words, is downlinked at 1.06 kbps. The time required to input a frame is approximately 0.604 seconds. Ninety frames (640 bits each) constitute one data cycle.

55.5.1.3 Slow Bit Rate (Contingency). During marginal transmitting conditions, the contingency mode can be used to transmit at one-half the normal bit rate (0.53 kbps). Each frame, as in the normal mode, consists of 64 ten-bit words and each data cycle consists of 90 frames. The time required to input a frame is approximately 1.21 seconds.

55.5.1.4 Frame Assignment. Both the normal and contingency downlink modes are classified as passive; their respective frame word assignments which are shown in figure 55-7 are:

a. Forty-three words in the downlinked frame are allotted for the Passive Seismic Experiment (PSE) contained within experiment package No. 2.

b. Seven words in the downlink frame are allotted for the Lunar Surface Magnetometer (LSM), contained within experiment package No. 1.

c. Four words in the downlink frame are allotted for the Solar Wind Spectrometer experiment (SWS), contained within experiment package No. 1.

d. Five words in the downlink frame are allotted for the Suprathermal Ion Detector Experiment (SIDE), contained within experiment package No. 4.

e. Five words within the data frame are allotted to control, CMD verification, and housekeeping data. The breakdown for each is given below:

(1) Control Words. Control words are illustrated in figure 55-8. The first 22-bits included in words 1, 2, and 3 of frame 1 contain the frame sync (16110355_8). Bits 3 through 9 of ALSEP word 3 contain the frame counter used to identify the parameters output by the 90-channel subcommutator. The frame counter counts from 01 to 89 then resets to 00 upon reaching the 90th channel. Loss of synchronization between the frame counter and 90-channel subcommutator may cause up to 54 seconds of invalid data in the normal mode and 108 seconds of invalid data in the contingency mode. Bit 10 of word 3 is the mode bit, which identifies bit rate (frames 1 and 2) or ALSEP ID (frames 3, 4, and 5) according to the frame counter.

1 SYNC	2 SYNC	3 SYNC AND ID	4 PSE	5* LSM	6 PSE	7 SWS	8 PSE
9 PSE	10 PSE	11 PSE	12 PSE	13 PSE	14 PSE	15 SIDE	16 PSE
17 LSM	18 PSE	19 LSM	20 PSE	21 LSM	22 PSE	23 SWS	24 PSE
25 PSE	26 PSE	27 PSE	28 PSE	29 PSE	30 PSE	31 SIDE	32 PSE
33 HOUSE- KEEPING	34 PSE	35 PSE	36 PSE	37 PSE	38 PSE	39 SWS	40 PSE
41 PSE	42 PSE	43 PSE	44 PSE	45 PSE	46* COM- MAND VERIFI- CATION	47 SIDE	48 PSE
49 LSM	50 PSE	51 LSM	52 PSE	53 LSM	54 PSE	55 SWS	56 SIDE
57 PSE	58 PSE	59 PSE	60 PSE	61 PSE	62 PSE	63 SIDE	64 PSE

*Command verification will appear in word 46 (ALSEP 1 and 2) or word 5 (ALSEP 3 and 4)

Note

Each box contains one 10-bit word.
Total bits per frame--10 x 64 = 640 bits.

Figure 55-7. ALSEP Normal/Contingency Mode Word Assignments

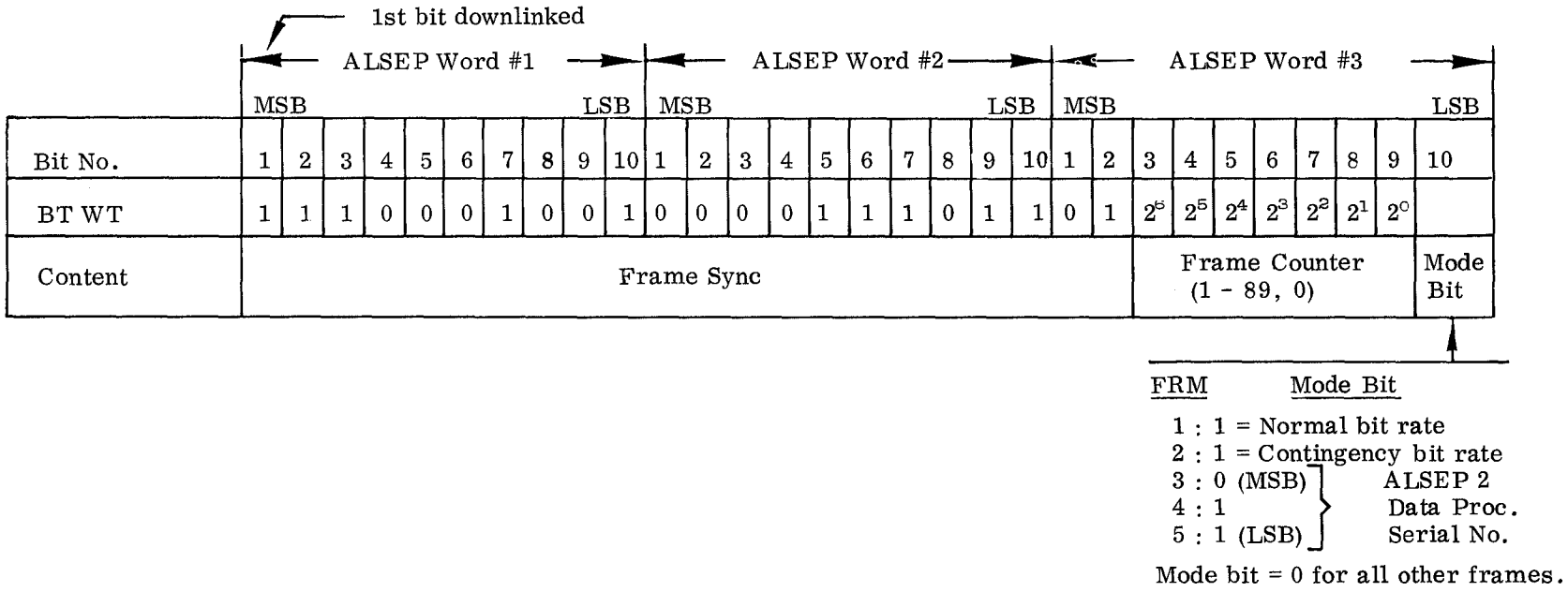


Figure 55–8. Control Words (Words 1, 2, and 3)

(2) CMD Verification. ALSEP word 46 (for ALSEP 1 and 2) or word 5 (for ALSEP 3 and 4) provides CMD verification. This configuration is illustrated in figure 55-9. Bits 3 through 9 reflect the 7-bit CMD as received by ALSEP, and bit 10 is a MAP. The MAP indicates a "1" when the error check has been successful and the CMD has been acted upon. The CMD verification word contains zeroes except during the one ALSEP frame following receipt of a CMD.

1st bit downlinked

MSB LSB

Bit No.	1	2	3	4	5	6	7	8	9	10
Content	0	0	CMD Received							

MAP: 1 = Good

Figure 55-9. CMD Verification (Word 46 or 5)

(3) Housekeeping Word. ALSEP word 33 is the output of the 90-channel sub-commutator. The 90 parameters of housekeeping data (voltages, temperatures, etc) are configured as shown in figure 55-10. Some of the channels are used by the experiments. Word 33 has no self-contained data sync and the parameter is identified by reading the 90-channel frame counter in ALSEP word 3.

1st bit downlinked

MSB LSB

Bit No.	1	2	3	4	5	6	7	8	9	10
Content	0	0	Digital Analog Housekeeping Data							

Figure 55-10. Housekeeping (Word 33)

55.5.1.5 High-Bit Rate

a. ALSEP vehicle 4 will contain the Active Seismic Experiment (ASE) which will downlink TLM data at a rate of 10.6 kbps. One master frame will consist of 32 twenty-bit words. Certain words will be subdivided into 5-bit words. Unlike the passive mode, no data cycle exists for the active mode; it is considered a whole for each frame input.

b. ALSEP word 1 will contain the 10-bit sync pattern used for identification of the active mode. Its value is $0073_{(8)}$. No mode bit, frame counter, or stream identifier exists in the active downlink mode.

55.5.1.6 PCM Stations

a. The RSDP will accept PCM data from four ALSEP vehicles transmitting in normal (1.06 kbps) and/or contingency rates (0.53 kbps), and prepare any two of the downlinked data streams for output. When ALSEP vehicle 4 is transmitting in the high-bit rate mode (10.6 kbps), its data will be accepted for input in addition to those normal or contingency downlinks previously accepted. However, the output of high-bit rate data will be determined by Format 2 selection.

b. Passive data (normal and contingency) is strictly through-put data. Active seismic data (high-bit rate) is processed by the RSDP for 106 s/s, 17 s/s and 2 s/s parameter data.

55.5.2 DATA PROCESSING

55.5.2.1 Normal/Contingency Modes (1.06 and 0.53 kbps)

a. Interrupt Processing. An external interrupt (the example configuration is shown below) will cause the initiation of input-with-monitor of a 64-word (10 bits each) buffer. The external interrupt must be checked for the correct indications as given. Following the successful input of the 64-word buffer, a monitor interrupt will be generated. This will cause the input buffer to be packed into the first available output position.

EXAMPLE

2^{29} - Abnormal bit

2^{28} - 2^{24} - Format ID ($26_{(8)}$ = Passive mode)

2^{23} - Tape playback

2^{22} - Major frame sync

2^{21} - 2^{0} - Sync (16110355_{8} = Passive)

b. Vehicle Validation

(1) Inputs will be validated on a frame basis (64 ten-bit words). A frame will be invalidated when setting of 2^{29} from the decom, failing the input time-out check, or receiving an incorrect input synchronization code. However, all data will be rejected until a valid ALSEP vehicle identification has been received. Since this vehicle identification is contained in frames 3, 4, and 5, no valid data will be output until frames 3, 4, and 5 have been validated, and the input vehicle identification and the vehicle format selected for output are known to correlate. (In the normal mode lock up may take up to 54 seconds and for the contingency mode 108 seconds may be experienced.)

(2) The time-out period for the normal and contingency rates will be 900 milliseconds and 1800 milliseconds, respectively.

(3) An indication of the input status must be made for each frame input. Using the LUK manual I/O routine, addresses 100014 through 100017 may be displayed to view PCM status words on EMU channels 0 through 3. If the vehicle input has been invalidated for any of the reasons stated above, bits 2 and 5 of the associated status word must be cleared. A detailed breakdown of status word configuration is given in paragraph 55.5.3.

c. Data Buffering

(1) Following valid vehicle identification in frames 3, 4, and 5 each validated frame for a maximum of four vehicles will be released for output. The only criterion is that any two of the four vehicles being input should be selected within the output format by the manual I/O routine. At this time the message "PCM LOCK CH X ALSEP Y" will be output on the 1232 and HSP, reflecting valid decom sync.

(2) Revalidation of vehicle identification will be required every 90 frame cycles. However, assuming proper input validation, the message printout will be on a first time only basis. If sync is lost or a non-input condition exists for 10 seconds or more, it will be necessary to reestablish vehicle identification for that particular channel. Any loss for a period of time less than 10 seconds will be considered only as a temporary loss of that vehicle's data. However, if that same vehicle is being input on another channel, any loss of input on the prime channel will cause an immediate switch to the other input channel; this channel would then be considered prime. A loss of input for 10 seconds or more will also cause the printout "SYNC LOST CH X ALSEP Y" to appear on the 1232 and HSP.

(3) For each frame released for output, the time tag (time of validation) and the status of the data will be associated with the frame. No actual reformatting will be done to any input frame and the whole frame will be released for output. However, it will take three HSD buffers (3 seconds of data) to output five input frames of data. This is the only formatting restriction.

(4) In the normal HSD output rate, it is possible (for reasons other than failure to validate) that no new input data will be available for output. This arises because of a slight difference between the normal input rate (1060 bits/sec) and the HSD output rate (1066.6 bits/sec). When this occurs (approximately every 3 minutes) the status word for the associated portion of output will reflect a static data situation in bits 2 and 5, (0 and 1) respectively. A fill pattern is not required to replace old data in this output block.

55.5.2.2 Active Seismic Mode (10.6 kbps)

a. General. Active seismic inputs will not be processed coincidentally with data from any other ALSEP vehicle.

b. Interrupt Processing. An external interrupt (the example configuration shown below) will cause the initiation of input-with-monitor of a 32-word (twenty bits each) buffer. The external interrupt must be checked for the correct indications as given. Following the successful input of the 32-word buffer, a monitor interrupt will be generated. This will cause the input buffer to be accessed for the data that is associated with that particular input frame.

EXAMPLE

2^{29} - Abnormal bit

2^{28} - 2^{24} - Format ID ($27_{(8)}$ = Active mode)

2^{23} - Tape playback

2^{22} - Major frame sync

2^{21} - 2^{0} - Sync ($0073_{(8)}$ _ 10 bits)

c. Vehicle Validation

(1) Inputs will be validated on a frame-by-frame basis (32 twenty-bit words). A frame (0.0604 seconds) will be invalidated because of setting of 2^{29} from the decom, failing the input time-out check (90 ms), or receiving an incorrect synchronization code. If invalidation of a frame occurs, fill data will be made available for output from that particular frame. The fill pattern is all zeros

and a one for each parameter (i.e., 5-bit parameter - 00001; 10-bit parameter - 00000 00001). Using the LUK manual I/O routine, addresses 100014 through 100017 may be displayed to view PCM status words on EMU channels 0 through 3.

(2) A count of validated frames between output buffers will be maintained for output each second. This is necessary since up to 16 or 17 frames may be input per output buffer. The actual status word will indicate live if at least one frame has been validated; this count will give the actual number of validated frames.

d. Data Buffering Technique

(1) Data will be moved into the intermediate buffer area from a frame upon the receipt of the input monitor interrupt for that frame. The count of validated frames must be incremented at this time.

(2) There are three basic types of data sampling rates for the input frame. Since the input is asynchronous to the output and a variable number of frames may be input per output buffer, the data will be accumulated in the intermediate buffer area in accordance with output requirements, and not with respect to the integrity of an input frame. The following is a description for each of the three types:

(a) 106 s/s (Geophone Data). Three five-bit parameters of this type are each input 32 times per frame. Every fifth data sample of each of these parameters will be taken from each frame; any remainder of a frame will be taken into consideration for even sampling of the frames to follow. The accumulation of 106 data samples for each of the three geophone parameters will terminate the building of the intermediate buffer.

(b) 17 s/s. Four five-bit parameters of this type are each input once per frame. Every sample will be taken from each frame. When 106 geophone samples are obtained, either 16 or 17 of these data types will be available in the intermediate buffer when this buffer area is terminated. If the 17th sample is not received before this time, the fill pattern (00001) will be used.

(c) 2 s/s. Thirteen 10-bit parameters of this type are each input once per frame. However, the ten bits are in two sequential five-bit sub-words in the input frame for each parameter. Every sample will be taken from each frame. Due to the low-sample rate, data from the first eight frames will overlay the same location in the intermediate buffer area (excluding the condition when a fill frame follows a valid one). The data from the remaining frames prior to the 106th geophone sample will overlay the second location in the intermediate buffer area (again, excluding the condition when a fill frame follows a valid one).

(3) The preceding dictates that the movement of data from a frame is governed by the accumulation of 106 samples of the geophone data in the intermediate buffer area. At that time all tables for each of the respective data types must be restarted. This will be true regardless of the number of 17 s/s type parameters that have been moved or what portion of an input frame has been sampled.

(4) In the case of an invalidated frame, normal data moves will pack the intermediate buffer area. However, the moves will access a fill data buffer (data patterns of 00001 and 00000 00001) to give a true indication of the input continuity.

55.5.2.3 Time Tagging

a. General. The RSDP will simultaneously time tag both live data and tape playback data from different ALSEP vehicles to an accuracy of 1 second. Should a condition arise where live and tape playback data from the same vehicle are input to the RSDP, the data being input on the higher order EMU channel will be made available for output.

b. Real-time Input

(1) Normal and Contingency Downlinks. When the ALSEP downlink sync words are received by the RSDP, the program will store the current GMT along with the sync words. The RSDP will also output the appropriate GMT time tag with each ALSEP downlink sync word that is output via HSD. The format for the GMT time tag is shown in figure 55-11.

(2) Active Seismic Downlink. The GMT time tag for the active seismic downlink will have the same format as shown in figure 55-11. However, the time will be output once per second and will be referenced to the output time of the HSD frame.

c. Tape Playback

(1) Normal and Contingency Downlinks. The RSDP will time tag playback data using the GMT recorded on the tape. It will simultaneously time tag both real-time and tape-playback data from different ALSEP vehicles. The formats for the time tags of tape playback are identical to those for real-time data (see figure 55-11).

(2) Active Seismic Downlink. The RSDP will time tag active seismic tape playback data using the GMT recorded on the tape. Otherwise the time tagging is identical to the real-time mode described in preceding subparagraph b(2).

55.5.3 HSD OUTPUT

55.5.3.1 General. The RSDP will output TLM data at a rate of 2.4 kbps in one of two high-speed formats; Format 1 - passive (normal and/or contingency data) and Format 2 - active (active seismic data). The primary difference in the two formats is that for the normal- and contingency-bit rates, all data is remoted; for the active seismic bit rate, only certain parameters are selected for output.

55.5.3.2 Normal and Contingency Bit Rates

a. Format. The high-speed format for these bit rates consists of three data frames; each frame consists of 240 ten-bit words. A detailed breakdown is given in figures 55-12 through 55-14.

b. Vehicles

(1) TLM data for a maximum of two ALSEP vehicles may be placed on only one HSD output line. Real-time and tape-playback data from the same vehicle will not be output in the same format. If data from only one ALSEP is available, a fill pattern of 0001_8 will be placed in the slots for the missing vehicle.

Word	LSB One MSB										LSB Two MSB										LSB Three MSB									
Bit	10	9	8	7	6	5	4	3	2	1	10	9	8	7	6	5	4	3	2	1	10	9	8	7	6	5	4	3	2	1
Bit Weight	2^0	2^1	2^2	2^3	2^0	2^1	2^2	2^3	2^0	2^1	2^3	2^0	2^1	2^2	2^0	2^1	2^2	2^3	2^0	2^1	2^0	2^1	2^2	2^3	2^0	2^1	2^2	2^0	2^1	2^2
Content	Units				Tens				Hund.		Un	Tens			Units				Tens		Units				Tens			Units		
	*Days										Minutes				Hours						Seconds							Minutes		

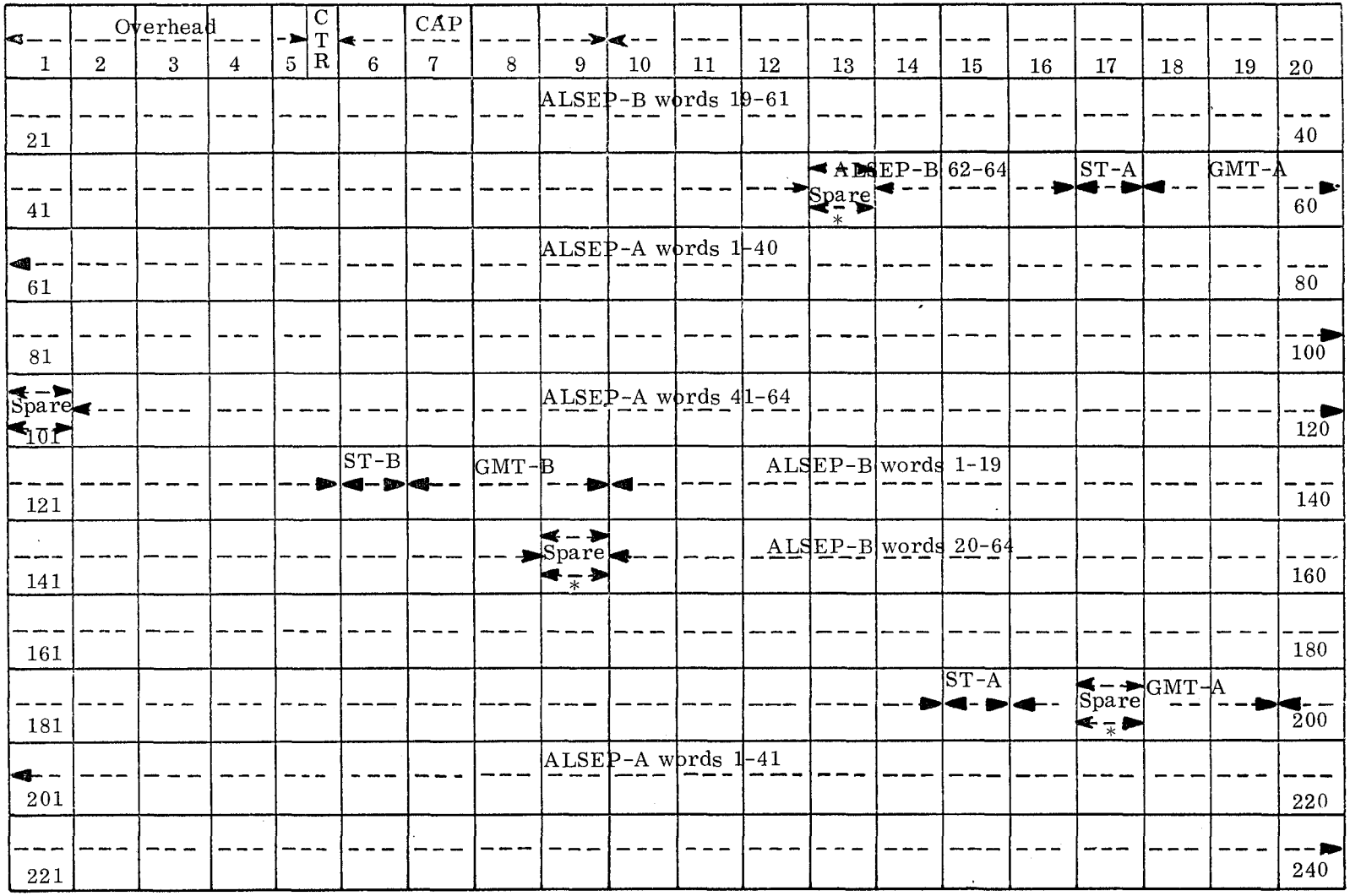
Days are in elapsed days from Dec. 31,
(i.e. Jan. 1 = Day 1)

Figure 55–11. GMT Format (Station Output/ALSEP Input)

1	2	3	4	5	CTR	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Overhead						CAP			ST-A		GMT-A								
21									ALSEP-A words I-39											40
41													Spare							60
61									ALSEP-A words 40-64										ST-B	80
GMT-B 81									ALSEP-B words I-18											100
Spare 101									ALSEP-B words 19-64											120
121																				140
141								Spare	Spare	ST-A	GMT-A									160
161									ALSEP-A words 1-43											180
181																	Spare *			200
201									ALSEP-A words 44-64										ST-B	220
GMT-B 221									ALSEP-B words1-18											240

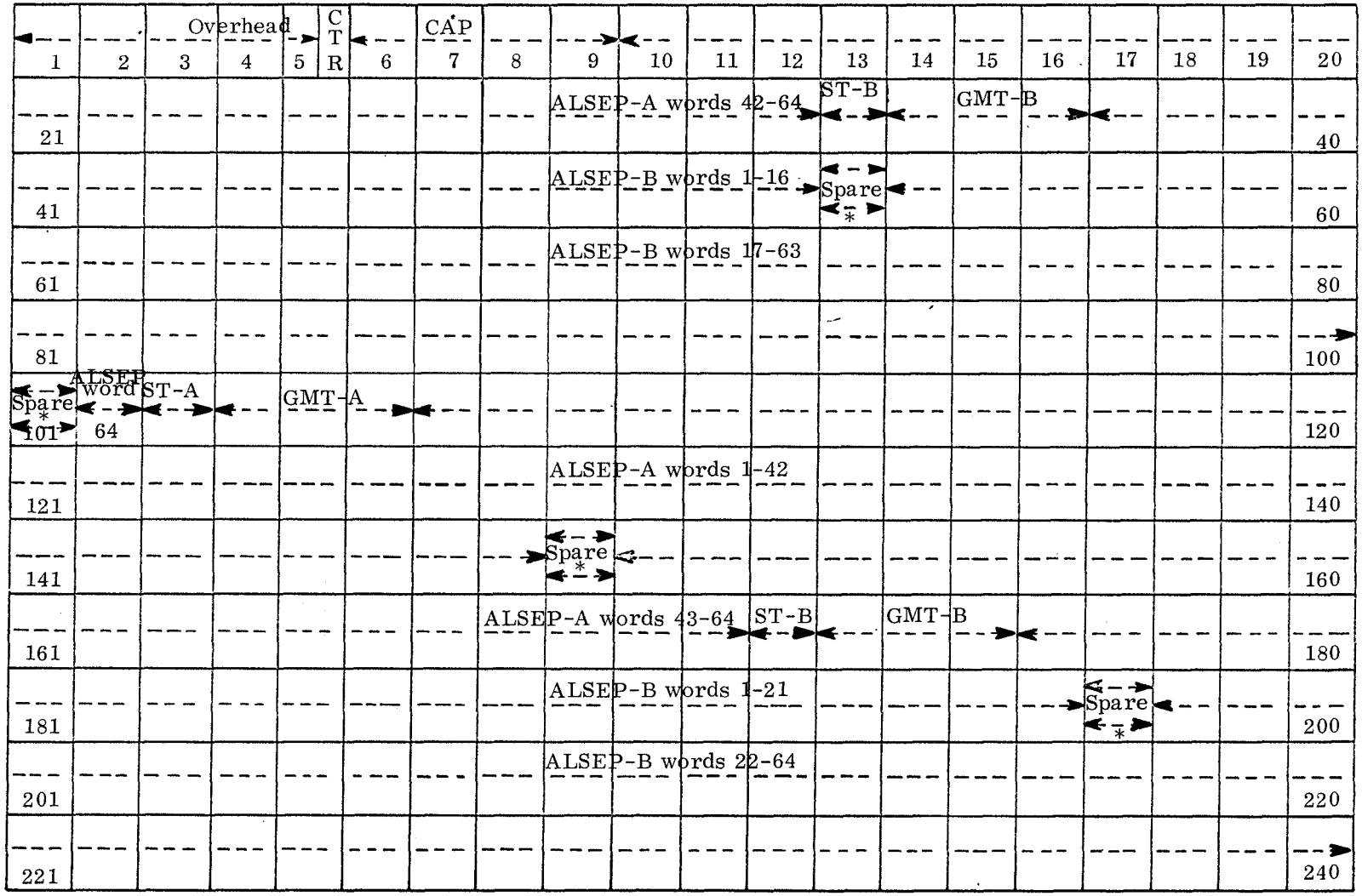
*This indicates the separation of two NASCOM Segments.

Figure 55–12. ALSEP HSD Frame 1 Output



*This indicates the separation of two NASCOM Segments.

Figure 55–13. ALSEP HSD Frame 2 Output



*This indicates the separation of two NASCOM Segments.

Figure 55-14. ALSEP HSD Frame 3 Output

(2) Before outputting data for any vehicle, the RSDP will first identify the vehicle. To make this identification, it will be necessary to save bit 10 of word 3 in downlink frames 3, 4, and 5. The MSB will be in frame 3.

(3) After the vehicle has been identified by using the vehicle IDs listed below, the RSDP will output the data on an availability basis.

ALSEP Vehicle	Vehicle ID (Binary)
1	010
2	011
3	101
4	110

(4) The vehicle ID will be checked each time it is received to verify that the vehicle data has not changed input channels. Only when an ID is positively identified as being invalid or being a valid change will the data output be altered. A failure to reverify an ID because of a sync drop in frame 5 will not cause the termination of data transmission. However, if frames 3 and 4 definitely indicate an ID different from the previously identified ALSEP vehicle, data transmission will be terminated. If the input vehicle ID does not correspond to those listed in subparagraph (3), a 1232 and HSP printout of "CH X INVALID ID YYY" will occur.

c. Data Loss

(1) If sync is lost or no data is input for a period of 10 seconds or more, vehicle identification must be reestablished for the data channel. Up to 54 seconds in the normal mode and 108 seconds in the contingency mode may be required to reestablish proper vehicle ID.

(2) Should data from one vehicle be established on more than one channel, the RSDP will designate one channel as prime, another as secondary, etc. A loss of sync on the prime channel will cause an immediate switch to the secondary input channel which will then be considered as prime.

d. Output Slot Designation. Determination of the ALSEP vehicle data to be output in either the A or B locations of the high-speed format will be made by a 1232 type-in (see paragraph 55.5.4). Figures 55-12 through 55-14 show slot identification in output frames 1, 2, and 3.

e. DTU Interface

(1) Transmission will be accomplished via Continuous Data Mode (CDM). The completion of transmission of an output buffer will generate a monitor interrupt. This interrupt will call upon the output routine and affect the actual output of the buffer which will have been packed.

(2) Synchronization with the DTU will be checked every 2 seconds by checking a flag which will be set in the monitor interrupt routine. If this check is failed, sync with the DTU will be considered lost. Upon detection of an out-of-sync condition, CDM will be disabled and 1232 I/O and HSP output messages will reflect this condition. A periodic executive call will guarantee that this program will get control to recognize an out-of-sync condition.

(3) The following sequence must be executed to ensure that the DTU is prepared to transmit the buffer:

(a) Computer sends a master clear External Function (EF) code to the DTU which initiates all registers.

(b) A wait period of a minimum of 2 milliseconds is necessary to transfer the master clear to the DTU.

(c) Computer sends an EF to the DTU which initiates the transmit mode.

(d) A wait period of a minimum of 7 milliseconds is necessary to transfer EF request to the DTU.

(e) Enable CDM.

(f) After sync characters are sent automatically by the DTU, the Output Data Request (ODR) is set.

(g) Computer initiates a buffer on a specified channel with CDM.

(h) The start of message and length of character followed by the 240-word buffer are then transferred to the DTU.

Under normal conditions no further DTU EFs will be necessary. The CDM will permit continuous packing and transmission of the alternate buffers. Only in case of failure of the sync check will this DTU initiation sequence be exercised.

f. Overhead Words

(1) General. The first ten words of each buffer will be considered overhead words (see figures 55-15 through 55-18).

(2) CAP Word. Words 6, 7, 8, and 9 of the HSD output frame will contain the CAP word which will be constructed by the RSDP and will consist of 26-data bits and 14 bits of error protection (see figure 55-17). Each CAP will be output a total of three times on the high-speed data line to MCC. Specific data-bit construction is given in paragraph 55.4.

(3) Status Word. Each ALSEP passive mode downlink frame will be preceded by the status word in the HSD output, as described below and shown in figure 55-18:

Bit	Setting	Explanation
(a) Bit 1 (MSB)	Set to 1	Last frame of vehicle data. There are three events that will cause this bit setting: (a) A 1232 request to change the portion of the high-speed format associated with this status word. The bit must be set for 3 seconds before the change will be made. (b) An LOS type-in has been made for the vehicle. (c) LOS-T has been typed-in setting all LFIs for 3 seconds and terminating HSD transmission.
	Set to 0	Not the last frame of vehicle data

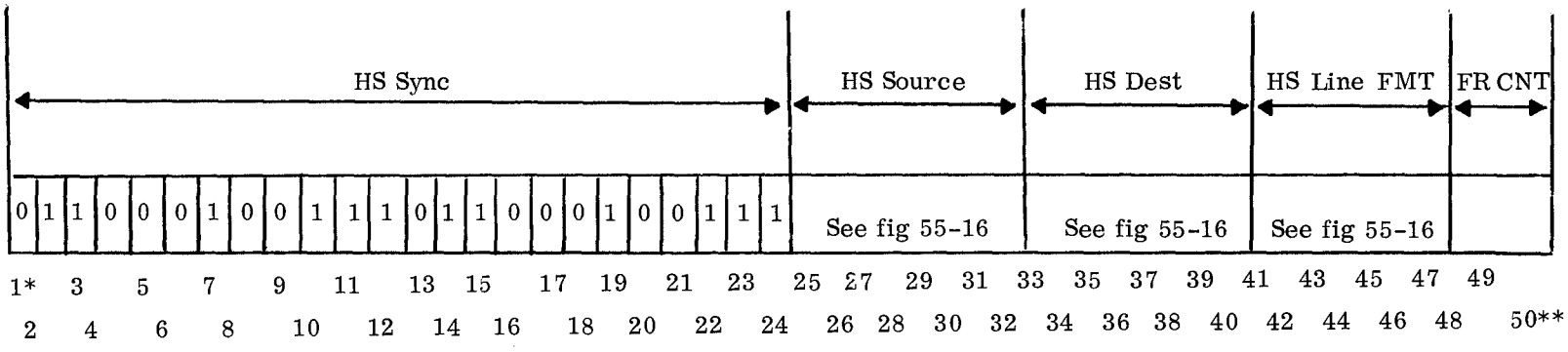


Figure 55–15. HSD Output Header Words

Source Codes

Station ID	NASCOM Bit No. 32	31	30	29	28	27	26	25
	Station Bit No. 31	30	29	28	27	26	25	24
MIL	0	1	0	0	0	0	0	0
GBM	0	1	0	0	0	1	0	1
ANG	0	1	0	0	1	0	0	1
BDA	0	1	0	0	1	1	0	0
ACN	0	1	0	0	1	1	1	1
CYI	0	1	0	1	0	0	0	1
MAD	0	1	0	1	0	0	1	0
CRO	1	0	1	0	0	1	0	0
HSK	1	0	1	0	0	1	1	1
GWM	1	0	1	0	1	0	1	1
HAW	1	0	1	0	1	1	0	1
GYM	1	0	1	0	1	1	1	0
GDS	1	0	1	1	0	0	0	0
TEX	1	0	1	1	0	0	1	1

Destination Code

Station ID ALSEP	NASCOM Bit No. 40	39	38	37	36	35	34	33
	Station Bit No. 39	38	37	36	35	34	33	32
0	1	1	1	0	0	0	0	

Data Format Code

Format ID	NASCOM Bit No. 48	47	46	45	44	43	42	41
	Station Bit No. 47	46	45	44	43	42	41	40
51	0	0	0	1	0	1	0	1
52	0	0	0	1	1	0	1	0

Format 51 = Normal and/or slow-bit-rate format

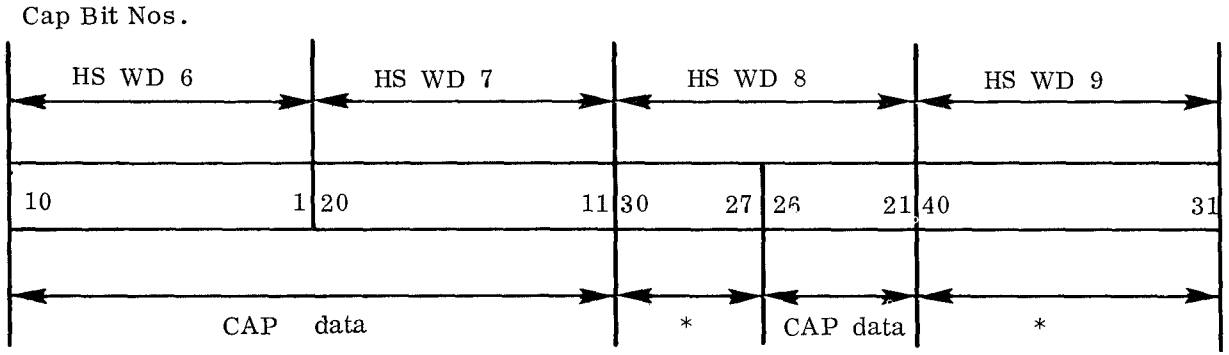
Format 52 = High-bit-rate format

Frame Counter

HS FRM	NASCOM Bit No. 50	49
	Station Bit No. 61	60
1*	1	0
2	0	1
3	1	1

*Always indicates 10 binary for active seismic

Figure 55-16. HSD Output Overhead Codes



* Polynomial error code

Note

See Section 55.4 for specific bit assignments.

Figure 55–17. CAP Format

LSB MSB

Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1

Bit 1 — 1 = Last frame of vehicle data
0 = Not last frame of vehicle data

Bit 2 — 1 = Live data
0 = Static or fill data

Bit 3 — 1 = Real-time data
0 = Playback data

Bit 4 — 1 = DTU out of sync for last frame(s)
0 = DTU in sync for last frame(s)

*Bit 5 — 1 = Fill data - indicates that the RSDP is outputting data at a rate greater than the downlink rate.
0 = Invalid data - indicates that the RSDP has failed to validate the following ALSEP data frames

Bits 6 & 7 — PCM carrier lock (USB Status)

Bits 8 & 9 — 01 = ALSEP #1
10 = ALSEP #2
11 = ALSEP #3
00 = ALSEP #4**

Bit 10 — 1 = Test
0 = Mission

Note: An ALSEP Status Word will be transmitted by the remote site for each ALSEP frame downlinked in the passive mode and once per output frame in the active mode.

*Bit 5 should be interrogated by MCC only when bit 2 = 0 for passive mode only.

**always = 00 for active

Figure 55-18. ALSEP Status Word

Bit	Setting	Explanation
(b) Bit 2	Set to 1	Live data (bit 5 has no significance)
	Set to 0	Static or fill data determined by bit 5. Set to 0 upon initiation
(c) Bit 3	Set to 1	Real-time data
	Set to 0	Tape playback data
(d) Bit 4	Set to 1	The DTU was out of sync at some time during the transmission of the last high-speed frame
	Set to 0	The DTU was in sync during the transmission of the last high-speed frame
(e) Bit 5	Set to 1	Fill data inserted because the RSDP outputs data at a rate greater than the downlink rate. Set to 1 upon initiation (live data has replaced fill data in the output slots)
	Set to 0	The RSDP has failed to validate the following ALSEP data frame:
(f) Bit 6	1 = USB System No. 1 PM receiver in lock 0 = USB System No. 1 PM receiver not in lock	
(g) Bit 7	1 = USB System No. 2 PM receiver in lock 0 = USB System No. 2 PM receiver not in lock	
(h) Bits 8 and 9	Set to 01	ALSEP 1 (Bit 8 = 0, Bit 9 = 1)
	Set to 10	ALSEP 2
	Set to 11	ALSEP 3
	Set to 00	ALSEP 4
(i) Bit 10	Set to 1	Test data
	Set to 0	Mission data (The value of bit 10 will be determined during initiation)

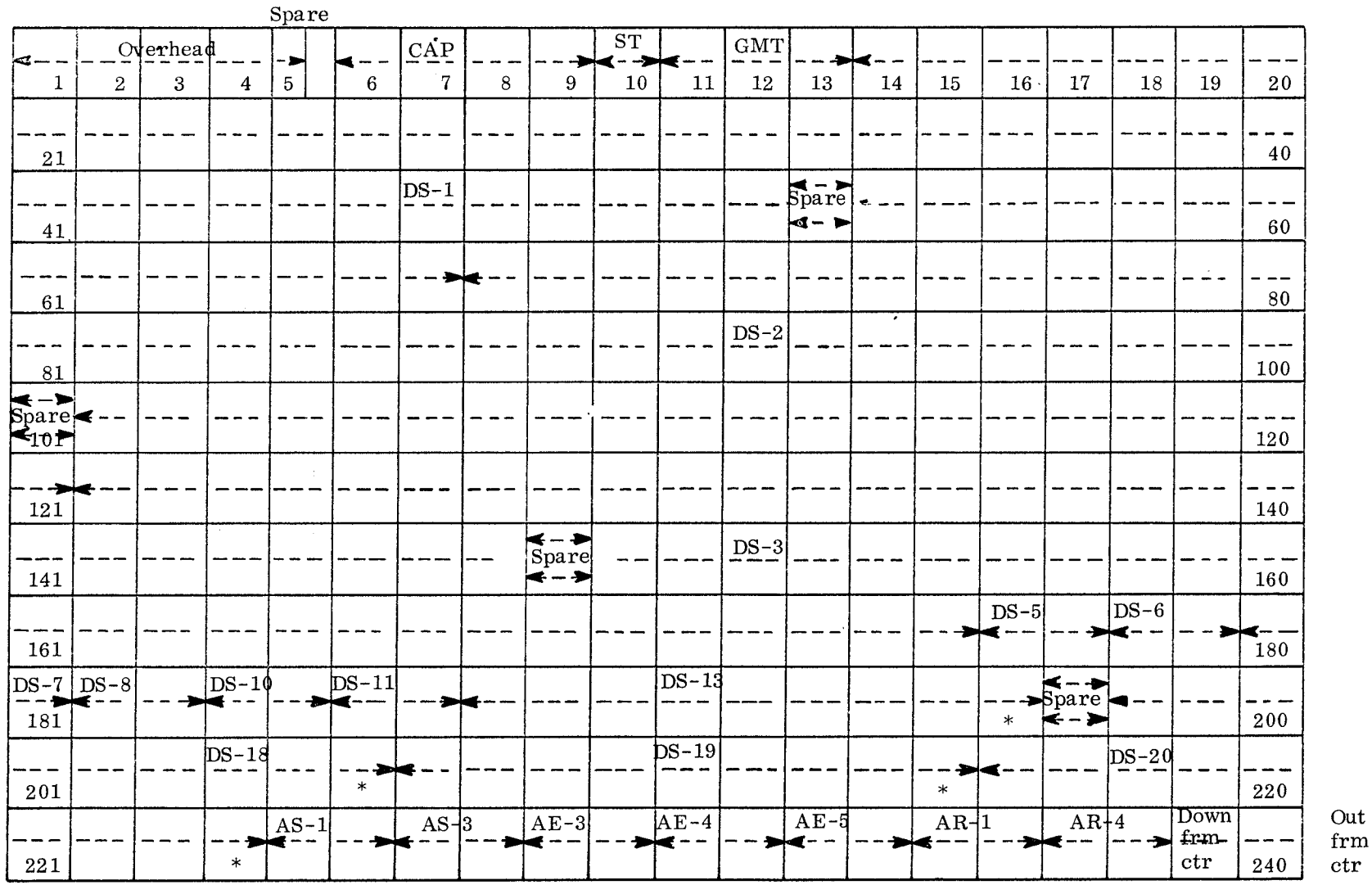
55.5.3.3 Active Seismic

a. General. The high-speed format for the active seismic bit rate (10.6 kbps) will consist of one data frame consisting of 240 ten-bit words. When the RSDP is processing active-seismic data, the processing of data from other vehicles is inhibited. A detailed breakdown is given in figure 55-19.

b. DTU Interface. Details of the DTU interface given in paragraph 55.5.3.2e are also applicable to active seismic operations.

c. Overhead Codes. The HSD output overhead codes are illustrated in figure 55-16.

d. CAP Word. The CAP word for active seismic operations is identical to that described in paragraph 55.5.3.2 f.



*The 5 LSBs of the ten-bit word contain a fill pattern.

Figure 55–19. Active Seismic HSD Format

e. Status Word. The status word is illustrated in figure 55-18.

f. HSD Word Formats. The construction of output word formats is illustrated in figure 55-20.

g. HSD Output Words 239/240. The five LSB of word 239 contain a counter which increments from 0 to 17 decimal. The contents of this counter will be the number of downlink frames validated during the previous second. HSD word 240 contains an output frame counter. There are fifteen unique output frames. The functions of these counters are illustrated in figure 55-21.

55.5.3.4 Fill Data. Initial failure of a vehicle data stream to input to the RSDP creates a void in the data output; therefore, a fill data pattern will be output to compensate for data omission from output format slots (see figure 55-22). A 0001_8 fill pattern will be output in all vehicle ten-bit parameter slots until valid vehicle data has been received by the RSDP. For five-bit parameter 01_8 will be used. The same fill patterns will be placed in all slots of the HSD output format for which no parameter has been assigned.

55.5.3.5 Static Data. Static data, rather than fill data, will be output as a result of input vehicle invalidation or if ROS is typed-in on the 1232 I/O console. In the latter case, the type-in will not clear the TLM buffers involved. Consequently, static data, rather than fill data, will be output until live data is available.

55.5.4 OUTPUT MESSAGES

55.5.4.1 HSP Outputs. The following is a listing of HSP messages:

Message No.	HSP Printout	Explanation
1	GMT ENABLED	The program is using the ISA time input for GMT data.
2	GMT DISABLED	There have been 10 timing and/or data errors in the last 30 seconds and the Real Time Clock is being used to calculate the GMT.
3	GMT TP ENABLED	The program is using the tape playback time input for GMT data.
4	GMT TP DISABLED	There have been 10 timing and/or data errors in the last 30 seconds and the Real Time Clock is being used to calculate GMT.
5	PCM LOCK CH X ALSEP Y	TLM for a particular ALSEP vehicle (designated by Y) is being received by the computer on an input channel designated by X. There could be up to four unique messages of this type (one for each EMU input channel).
6	SYNC LOST CH X ASLEP Y	The TLM for a particular ALSEP vehicle (designated by Y) is no longer being received by the computer on an input channel designated by X. There could be up to four unique messages of this type (one for each EMU input channel).

1st bit transmitted

Bits	10	9	8	7	6	5	4	3	2	1
Value	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9
Content	LSB 2nd word Received (site) MSB					LSB 1st word Received (site) MSB				

Format for HSD words 14-52, 54-100, 102-148, 150-175, 188-195, 198-205, 207-214, 216-223

1st bit transmitted

Bits	10	9	8	7	6	5	4	3	2	1
Value	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9
Content	LSB One Data Word MSB									

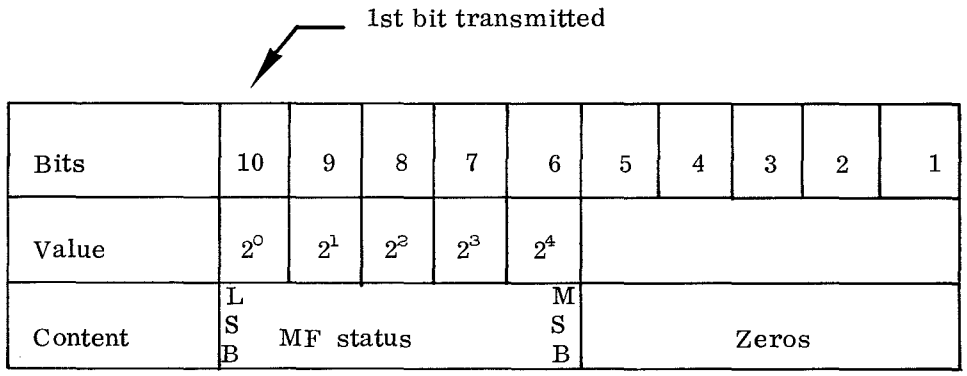
Format for HSD words 176-187, 225-238

1st bit transmitted

Bits	10	9	8	7	6	5	4	3	2	1
Value	2^0	2^1	2^2	2^3	2^4	2^0	2^1	2^2	2^3	2^*
Content	1	0	0	0	0	LSB Data				MSB

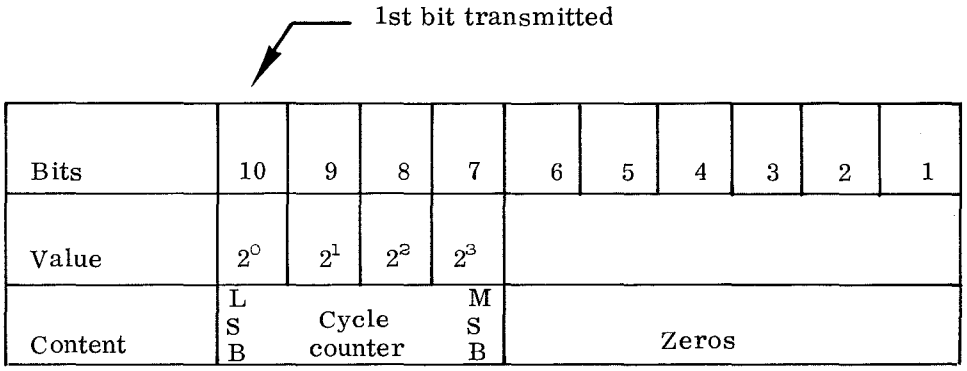
Format for HSD words 196, 206, 215, or 224

Figure 55–20. Active Seismic HSD Word Outputs



HSD word 239-counter indicating number of ASE frames which were validated by the station. Counter indicates from 0 to 17 (decimal.)

Example: 00001 LSD = data from 1 valid frame included in this HSDF.



HSD word 240 counts 0 to 15 (decimal) and recycles
(Indication for reception of consecutive HSD frames at MCC).

Figure 55–21. ASE Frame Status and Cycle Counter

1st bit Tx by station

	LSB									MSB
Bits	10	9	8	7	6	5	4	3	2	1
Value	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9
Content	1	0	0	0	0	0	0	0	0	0

Fill pattern
(10 bit)
passive and active modes

1st bit Tx by station

	LSB				MSB	LSB				MSB
Bits	10	9	8	7	6	5	4	3	2	1
Value	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9
Content	1	0	0	0	0	1	0	0	0	0

Fill pattern
(5 bit)
active mode only

Figure 55–22. HSDF Fill Pattern

Message No.	HSP Printout	Explanation
7	FMT 1 SELECT YA ZB	The program is configured to output TLM data from any two ALSEP vehicles (designated by Y and Z) which are downlinking in the normal or contingency rate. The A and B designators indicate the relative position of a particular vehicle's TLM within the output format.
8	FMT 2 SELECT	The program is configured to output TLM from the active seismic ALSEP experiment.
9	LOS X	A 1232 input to inhibit TLM signal for all or a particular ALSEP caused by loss of signal. X is T for total or 1-4 for individual ALSEP.
10	ROS X	A 1232 input to enable TLM input caused by return of signal. X is T for total or 1-4 for individual ALSEP.
11	DTU OUT OF SYNC	Indicates an out-of-sync condition as a 2-second check of DTU output transmission.
12	DTU IN SYNC	Indicates sequential high-speed data output frame transmission during a 2-second period.
13	CH X INVALID ID YYY	The ALSEP data processor serial number which is being received in the TLM stream on EMU channel X is not a legitimate 3-bit code. The downlink bits are designated by YYY.

55.5.4.2 1232 Outputs. The following is a listing of 1232 printer messages:

Message No.	1232 Printout	Explanation
1	DTU OUT OF SYNC	An out-of-sync condition occurs as a result of a 2-second check of DTU output transmission.
2	DTU IN SYNC	Sequential high-speed data output frame transmission occurs during a 2-second period.
3	FMT 1 SELECT YA ZB	The program is configured to output TLM data from any two ALSEP vehicles (designated by Y and Z) which are downlinking in the normal and contingency rate. The A and B designators indicate the position of a vehicle's TLM within the output format.
4	CH X INVALID ID YYY	The ALSEP data processor serial number which is being received in the TLM stream on EMU channel X is not a legitimate 3-bit code. The downlinked bits are designated by YYY.

Message No.	1232 Printout	Explanation
5	FMT 2 SELECT	Program is configured to output TLM from the active seismic ALSEP experiment
6	GMT ENABLED	Indicates that the program is using the ISA input for data
7	GMT TP ENABLED	Indicates that the program is using the tape-playback time input for GMT data
8	GMT DISABLED	Indicates that there have been 10 timing and/or data errors in the last 30 seconds and the Real Time Clock is being used to calculate the GMT
9	GMT TP DISABLED	Indicates that there have been 10 timing and/or data errors in the last 30 seconds and the Real Time Clock is being used to calculate GMT
10	GMT ERRORS XX YY	Indicates that there have been XX data errors and YY timing errors in the last 10 seconds. This message may appear more frequently than every 10 seconds when a disable condition is sensed.
11	GMT TP ERRORS XX YY	Same explanation as for message No. 10 above but in reference to TP GMT
12	PCM LOCK CH X ALSEP Y	The TLM for a particular ALSEP vehicle (designated by Y) is being received by the computer on an input channel designated by X. There could be up to four unique messages of this type (one for each EMU input channel).
13	SYNC LOST CH X ALSEP Y	The TLM for a particular ALSEP vehicle (designated by Y) is no longer being received by the computer on an input channel designated by X. There could be up to four unique messages of this type (one for each EMU input channel).

55.6 MANUAL I/O ROUTINES

55.6.1 The 1232 I/O console typewriter is used to access the ALSEP program to perform the following manual routines:

a. MWP. Change the MAP waiting period (1000 milliseconds to 5000 milliseconds)

b. VAD. Change vehicle/decoder address

c. STA. Change station ID

d. CAM. Reassign CAM

e. CMH. Enable off-line CMD history

f. LUK. Call up and printouts for inspection, any location in core

g. LOS. Terminate output of TLM data

h. ROS. Resume processing of TLM data

i. FMT. Change output format

55.6.2 The 1232 typewriter is used to input system initiation constants, e.g. station ID, MTB, FMT, MTU, and GMT. The 1232 tape reader is used to input ALSEP program errata and the ALSEP backup automatic recovery feature.

55.6.3 To initiate routines MWP, VAD, STA, and CMH via the 1232 console, it is first necessary to:

a. Select Mode 1 (CAM 979)

b. Select M&O Mode (CAM 978)

c. Press KEYBOARD and INTERRUPT

d. Press RETURN; this causes the initial interrupt to be sent to the ALSEP program.

Note

1. The remaining I/O routines do not require M&O Mode selection.

2. A RETURN pressed during a type-in will reset the keyboard and the entire procedure must be repeated.

3. If a mistake is made during type-in, an INPUT ERR WD HH printout will occur.

4. Whenever a ↑ is pressed, the associated ALSEP parameters will be modified and a carriage return, line feed, and manual I/O mnemonic will be typed out. At this point other changes may be entered for the current mnemonic. The program is completed by pressing SPEC, whereby the manual I/O mnemonic will be typed out, the routine will be exited, and the ALSEP data pool will be flagged to write on to the recovery tape.

55.6.4 The following are the ALSEP manual I/O routines:

a. VAD. Type VAD, AA, XXX, ↑ □

where:

AA = Vehicle/decoder address to be modified

A1 = Decoder A, Vehicle 1

B1 = Decoder B, Vehicle 1

A2 = Decoder A, Vehicle 2

B2 = Decoder B, Vehicle 2

A3 = Decoder A, Vehicle 3

B3 = Decoder B, Vehicle 3

A4 = Decoder A, Vehicle 4

B4 = Decoder B, Vehicle 4

XXX = New vehicle/decoder address

b. MWP. Type MWP, AAAA, ↑ □

where:

AAAA = Decimal in milliseconds

c. STA. Type STA, AAA, ↑ or STA, BB, ↑ □

where:

AAA = Three alpha character abbreviation for station name

BB = Two numeric digits for station name (lead zero may be omitted)

d. CAM. Type CAM, AAA, ↑

where:

AAA = TLM or CMD

e. CMH. Type CMH, ↑ □

f. LUK. (legal in FC Mode).

(1) Type: LUK, AAAAAA,

where:

AAAAAA = Address you desire to look at (000000 thru 137777). The computer will respond with: BBBBB BBBBB,

where:

BBBBB BBBBB = Contents of address selected

(2) To repeat the inspection of a given address after performing a LUK:

(a) Type: R ↑

(b) The program will output: LUK, AAAAA, BBBBB BBBBB, R

(c) To continue the repeat inspection, press ↑

(d) To look at another address, press RETURN, and type:

AAAAAA

(e) To look at a sequential address, press: ↑

g. LOS. Type LOS, X, ↑ □

where X = 1 - Vehicle 1
2 - Vehicle 2
3 - Vehicle 3
4 - Vehicle 4
T - All Vehicles

h. ROS. Type ROS, X, ↑ □

where X = 1 - Vehicle 1

2 - Vehicle 2

3 - Vehicle 3

4 - Vehicle 4

T - All vehicles

i. FMT. Type FMT, X, YA, ZB, ↑ □

where X = FMT 1 - Passive

X = FMT 2 - Active

YA = Vehicle/slot designation (passive only)

ZB = Vehicle/slot designation (passive only)

55.7 PROGRAM OPERATING INSTRUCTIONS

Program operating instructions for the ALSEP operational program and the ROACH and ABARF programs are contained in the Software Catalog for the Apollo Network (SCAN).

55.8 PROGRAM CHANGES

55.8.1 GENERAL

Program changes to operational programs are issued as errata and sent by mail or high- or low-speed lines.

55.8.2 HIGH SPEED

Program changes received via HSD lines directly from GSFC will be received, punched, and verified by use of the errata receive program. Operating instructions are given in SCAN.

55.8.3 LOW SPEED

Whenever high-speed errata transmission fails, teletype is used as a backup. A received teletype tape containing operational program changes must be converted into a fully perforated TTY tape for use by the 1232 reader. When a fully perforated tape has been made, it will be used as an input to the 642B program CONTELFED, or the 1218 program TELFED. Either of these programs is capable of converting the teletype tape into a field data (errata) tape. Instructions for each program are given in SCAN.

55.9 PREPASS CHECKLISTS

55.9.1 PREREQUISITES

The station readiness test must have been completed and the operational program loaded.

55.9.2 ALSEP 642B COMPUTER

Switch/Function	Indication/Action
a. AUTOMATIC RECOVERY	Up
b. ADDRESS MODE	Up (17 bit)
c. BOOTSTRAP PROGRAM I/II	I
d. INDICATE/OFF/INDICATE SET	INDICATE
e. PROGRAM STOP	
f. PROGRAM JUMP	Down
g. DISCONNECT	

55.9.3 DATA TRANSMISSION UNIT (DTU)

Switch/Function	Indication/Action
a. TRANSMIT DISABLED/TRANSMIT ENABLED	TRANSMIT ENABLED (Green)
b. RECEIVED DISABLED/RECEIVE ENABLED	RECEIVE ENABLED (Green)

55.9.4 TYPE 1259 TTY ADAPTERS

Switch/Function	Indication/Action
a. Auxiliary control panel - AUX LINE RELAY	ON-LINE
b. Auxiliary control panel - LINE/TEST	LINE
c. Auxiliary control panel - MOTOR ENABLE	Lit
d. The 1259 should have adequate printing ribbons, paper tape, and printer paper	
e. NORMAL/MODIFIED	ALSEP 1259 - NORMAL
f. AUXILIARY/REPERFORATOR	ALSEP 1259 - OFF
g. Computer line	ALSEP 1259 - ON LINE
h. K-KT-T	T position

55.9.5 TYPE 1232 I/O CONSOLE

Switch	Setting
a. ON-LINE/OFF-LINE	ON-LINE
b. Tape levels	6-7
c. ABARF mounted in tape reader	

55.9.6 TYPE 1540 MAGNETIC TAPE UNIT

Switch/Function	Indication/Action
a. HANDLER ADDRESS switches	
(1) ALSEP	
(a) ALSEP Recovery	ADDRESS 1
(b) ALSEP History	ADDRESS 2
(2) Program Load	
System Tape	ADDRESS 1
b. MAN/OFF/AUTO	AUTO
c. CLOCK CONTROL	NORMAL
d. Handler cabinet WRITE ENABLE	ALSEP MTU - ON Program Load TLM MTU - 1 OFF

e. Systems tapes will have the write rings removed

f. Fresh scratch tapes for command history/ recovery should be mounted as the pass requires.

55.9.7 HIGH-SPEED PRINTERS

Switch	Indication
POWER ON	Lit

55.9.8 SWITCHES, TYPE 1299

Switch	Setting
a. UDB TX	ALSEP Computer
b. UDB RX	ALSEP Computer
c. CMD STATUS	ALSEP Computer
d. GMT (Tape)	ALSEP Computer

55.9.9 UPDATA BUFFER

Switch/Function	Indication
a. OPERATE/TEST	OPERATE
b. Computer TEST/OPERATE	OPERATE
c. SAFE indicator	Advise M&O when lit

55.9.10 1218 COMPUTER

For the prepass check on the 1218 computer, it is assumed that the 29-point acquisition message has been converted by the CADCPS program to generate an APP backup tape and that CADCPS is cycling for real-time operation.

Switch/Function	Indication/Action
a. INDICATE/OFF/INDICATE SET	INDICATE
b. SKIP/STOP	To satisfy operational requirements

55.10 CONTINGENCY PROCEDURES

55.10.1 If a failure of computer or peripheral equipment occurs, certain contingency procedures can be applied to configure the remaining hardware to meet MCC requirements. Either 642B computer and either MTU/channel may be used for normal operation. If the computer or MTU/channel fails, the other may be used with MCC or GSFC concurrence. Since four MTU transports are available per MTU, there are two spare transports per MTU or six per station (except MIL).

55.10.2 Switch the following 1299 switches if the opposite computer is to be used:

a. GMT (TAPE)

b. COMMAND STATUS

c. UDB TX

d. UDB RX

55.11 TESTING

Refer to the current issue of the "Index-Manned Space Flight Network Instruction Manuals," for applicable manuals, reference documents, and tests. A description of the Index and instructions for requesting documents contained therein is given in Section 10 of the NOD.

55.12 COMPUTER FAULT RECORDS

Computer fault records are described in paragraph 55.13 of the NOD.

SECTION 57. TELEMETRY

57.1 GENERAL

Selected MSFN stations will provide the following telemetry support:

a. Receiving and recording ALSEP telemetry links

b. Decommutating two telemetry links simultaneously in any one of the following combinations:

(1) Two live

(2) One live and one playback

(3) Two playbacks.

57.2 BASIC TELEMETRY FORMAT DESCRIPTION (ALL LINKS)

Each ALSEP can transmit PCM telemetry in a normal or contingency bit-rate mode. In addition, the active seismic experiment (ALSEP 4 only) is capable of transmitting in a high-bit-rate mode. The basic characteristics of the ALSEP PCM telemetry formats are:

Normal Bit Rate	Contingency Bit Rate	High Bit Rate
1060 bits/sec	530 bits/sec	10,600 bits/sec
10 bits/word	10 bits/word	20 bits/word
64 words/frame	64 words/frame	32 words/frame
640 bits/frame	640 bits/frame	640 bits/frame

57.3 MAGNETIC TAPE RECORDING INSTRUCTIONS

Tape recorder assignments are contained in table 57-1. Recording speed will be 3-3/4 ips for the wideband recorder. If a station's view period is such that one tape is not sufficient, then recorders No. 1 and 2 will be operated in series, with recorder No. 2 being turned on 1 minute before recorder No. 1 runs out of tape.

57.4 TIME CODE TRANSLATOR AND DATA PLAYBACK

The output of the wideband magnetic tape recorder track No. 3 will be patched to the Datatron time code translator. During recording the front panel indicator on the translator should be checked periodically to ensure that it is updating every second and that the time indicated is the actual GMT (minus record/reproduce time). When MCC requests data playback, the appropriate magnetic tape, track No. 3 will be patched to the time code translator.

Table 57-1. Telemetry Recorder Setup for ALSEP

TRK	Recorder No. 1	Mode	TRK	Recorder No. 2	Mode
1	Voice Annotation	DIR	1	**Note**	
2	Open		2	Patch redundant to recorder No. 1	
3	NASA 36 bit/1 kHz Timing	FM	3		
4	USB CMD Ver Rcvr	FM	4		
5	2276.5 ALSEP No. 2 Video	FM	5		
6	2278.5 ALSEP No. 1 Video	FM	6		
7	2275.5 ALSEP No. 3 Video	FM	7		
8	2278.5 ALSEP No. 4 Video	FM	8		
9	SDT/1 kHz	DIR	9		
10	USB Mixer & Cyclelock	DIR	10		
11	TLM Data Modem	DIR	11		
12	Net during deployment only	DIR	12		
13	Open		13		
14	Open		14		
TRK		Mode	TRK		Mode
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		

57.5 PULSE CODE DECOMMUTATION

All stations will use the formats and programs referred to in table 57-2 as applicable. TLM links will be processed according to their priority as stated in the SCM message. Stations with MSFTP-1 decommutators will be required to patch a set of normal and high acquisition and distribution patchboards for each decom on station. Decom No. 1 and No. 2 will be configured for active support (real-time or playback). Decom No. 3 will be configured for backup to decom 1 or 2. Stations will ensure that the backup decom is inhibited. During receive/record mode only (Phase III) the decommutators will process data to provide USB with ALSEP receiver prelimit level and transmitter AGC.

Table 57-2. Decom/Simulator Formats and Programs

Seq No.	Type	Program	Format
1001	Decom	Normal/contingency (passive)	1
	Decom	High (active)	2*
	Decom	2.4 high bit rate	3*
	Decom	2.4 normal bit rate	4
1002	Simulator	Normal/contingency (passive)	1
	Simulator	High (active)	2*
	Simulator	2.4 high bit rate	3*
	Simulator	2.4 normal bit rate	4

*for ALSEP 4 only during high bit rate

57.6 MSFTP-1 SETUP INSTRUCTIONS

57.6.1 MSFTP-1 EMR WB SIGNAL CONDITIONER

a. Mode: SP

b. Filter: LIN

c. Polarity: NOR

d. Bit Rate

Normal: 2.12 kbps,
Contingency: 1.060 kbps,
High: 21.2 kbps

e. Sync Allowable Errors

Frame and subframe:	Search	Check		Lock	
		Patt	Err	Patt	Err
	1 err	1	0	1	0

57.6.2 BSC 307 DYNATRONICS SIGNAL CONDITIONER

a. Mode: S0

b. Detector: I/D

c. Bandwidth: 3 percent

d. Polarity: +

e. DC Restoration: IN

f. Bit Rate

Normal: 1.060
Contingency: 0.530
High: 10600

57.6.3 ACQUISITION PATCHBOARD (NORMAL/CONTINGENCY BIT RATE)

a. Patchboard ID: Patch 2, 4, and 16

b. Parallel to Serial Converter: No patch

c. Parity: OFF

d. Trans: MSB 1st

e. Frame Length

CHN: 63
CHN-1: 62

f. Word Length: Constant

Most common word length: 10 bits

Word 1: 8 bits

Word 63: 22 bits

g. Word Synchronizer: No patch

h. Frame Synchronizer

Window: 1 bit

ACC: OFF

SCC: OFF

Pattern:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	X		X	X		X	X	X					X			X				X	X
0		X			X				X	X	X	X		X	X		X	X	X		

	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	X																		
0																			

Do not patch in excess of the frame word length.

i. USB Patch: ON

57.6.4 DISTRIBUTION PATCHBOARD (NORMAL/CONTINGENCY BIT RATE)

a. Patchboard used: Top

b. ID Subframe Synchronizer 3: Patch

c. ID Count: Up

d. ID Information

MSB LSB

8	7	6	5	3	2

e. Preset

	128	64	32	16	8	4	2	1
1								
0	X	X	X	X	X	X	X	X

f. 1/1 Ratio: ON

g. ID Word: CH: [1]

h. ID Frame: FR: [ALL]

i. Subdecommutation Patching: Patch

j. FRN - Frame Gate Generators

FG 1: FR [90] from F1 area

FG 2: WORD [63] from word gate area

FG 3: FR [ ] from F3 area

FG 4: FR [ ] from F4 area

k. Subframe Synchronizer Selection

	FG1	FG2	FG3	FG4	
SF1					SF1
SF2					SF2
SF3	X				SF3
SF4					SF4
FS					FS
	FG1	FG2	FG3	FG4	

l. FRN - Subframe Synchronizers

SF 1: FR [ ] from F [ ]

SF 2: FR [ ] from F [ ]

SF 3: FR [90] from F [1]

SF 4: FR [ ] from F [ ]

Note

Patch word 63 to INV BUFF "IN". Patch INV BUFF OUT to Regrouping area.

m. Digital to Analog Converters

DAC	Word	Frame
9	32	21
10	32	51
60	32	66

57.6.5 ACQUISITION PATCHBOARD (HIGH BIT RATE)

a. Patchboard ID: Patch 1, 2, 4, and 16

b. Parallel to Serial Converter: No patch

c. Parity: OFF

d. USB: ON

e. Trans: MSB 1st

f. Frame Length:

CHN: 32
CHN-1: 31

g. Word Length: Constant
Most common word length: 20 bits

h. Word Synchronizer: No patch

i. Frame Synchronizer

Window: 1 bit

ACC: OFF

SCC: OFF

Pattern:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1											X	X		X	X	X					
0	*	*	*	*	*	*	*	*	*	*			X				X	X	X	X	

	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1																			
0																			

Do not patch in excess of the frame code length.

*No patch

57.6.6 DISTRIBUTION PATCHBOARD (HIGH BIT RATE)

a. Patchboard Used: TOP

b. ID Subframe Synchronizer 3: No patch

c. Preset

	128	64	32	16	8	4	2	1
1								
0	X	X	X	X	X	X	X	X

d. 1/1 Ratio: ON

e. Frame Gate Generators

FG 2: WD [32] from channel gate-area

f. Patching: Patch word 32 from channel gate area to FRN of frame gate gen No. 2. Patch FRN of frame gate No. 2 to Inv Buffer In. Patch INV BUFF OUT to regrouping area.

57.7 MSFTP-2 PCM SETUP

57.7.1 WIDEBAND SIGNAL CONDITIONERS

Normal/Contingency Bit Rate	High Bit Rate
Bit Rate: Normal: 2.12 kbps Contingency: 1.060 kbps	21.2 kbps None
Code Type: SPLIT-ϕ	SPLIT-ϕ
Input Voltage: 1-15	1-15
Loop BW: Med	Med
Detector: I/D	I/D
Mode Select: LOCAL	LOCAL
DC Restoration: IN	IN
Polarity: POS	POS

57.7.2 NARROWBAND SIGNAL CONDITIONERS

Normal/Contingency Bit Rate	High Bit Rate
Code Type: SPLIT-ϕ	SPLIT-ϕ
Input Voltage: 1-15	1-15
Loop BW: Med	Med
Detector: I/D	I/D
Mode Select: *Program	Program
DC Restoration: IN	IN
Polarity: POS	POS

*Local when in contingency

57.7.3 DECOMMUTATOR CONTROL

a. Sync Allowable Errors

Frame:	I		II		III	
	1	2	Patt	Err	Patt	Err
	1	0	1	0	2	0

ID Pattern errors: 2

b. FS III errors: 1

57.8 COMPUTER BUFFER PATCHING

Refer to paragraph 57.1.7.2 of the NOD.

57.9 EXCITER CONSOLE PATCHING

The following measurements will be patched to the respective meters on exciter consoles in the USB area:

a. Receiver prelimit level from DAC 9

b. Transmitter A AGC voltage from DAC 10

c. Transmitter B AGC voltage from DAC 60

d. Decom lock.